

# THE IRON AGE

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## Producing a Stamped Shift Lever Dome

Success Attained by Proper Proportioning of Various Draws—Only One Annealing Necessary—Dies and Method of Production Described

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THE method of producing the shift lever dome illustrated, by means of a series of press operations, involves a series of reductions to bring the cup to a conical shape and then stamping it to a smooth surface. This process is characteristic of all conical shapes in general when produced by means of straight sided single action presses.



Stamped Shift Lever Dome

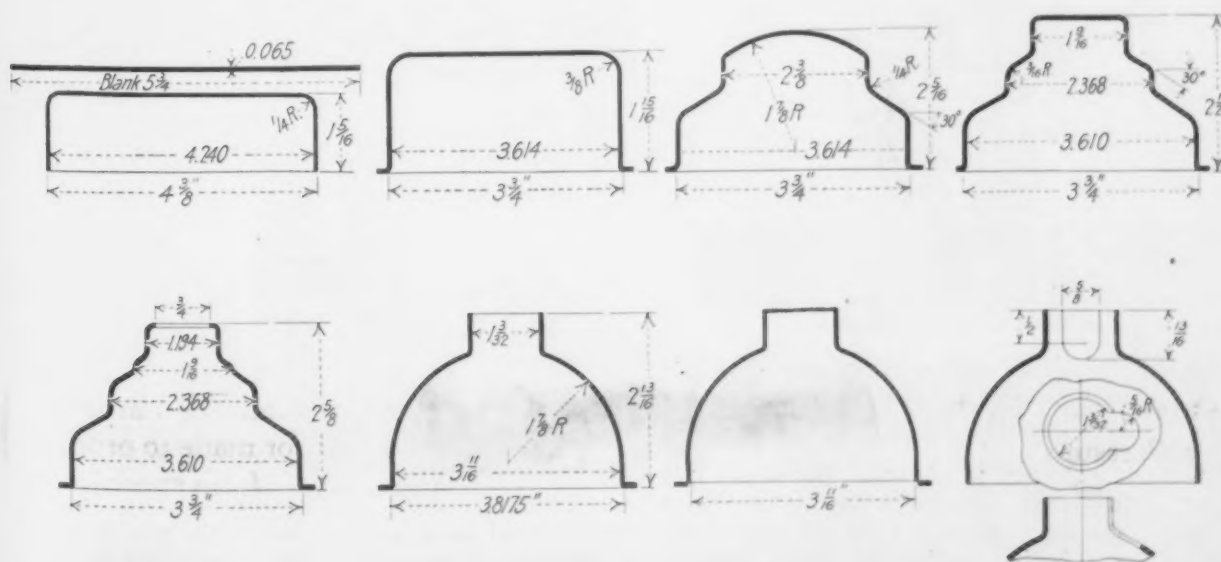
These shift lever domes have been produced successfully in large numbers on the above mentioned type of press, fitted with the conventional rubber buffer attachment. The success attained in stamping this part was due mainly to the use of the

proper radii and the proper proportioning of the various draws. Only one annealing of the cup was found necessary, which was just before the finish-shape operation. A cheap grade of slushing oil was used to lubricate the stampings during the several drawing operations. The steel used was a hot rolled strip, 5% in. wide, of good drawing quality, pickled and oiled.

The first operation is a combination in which the blank is cut to 5% in. in diameter and then drawn to a depth of 1 5/16 in. and to a diameter of 4% in. A Bliss press, No. 74 1/2, was used for this work. The die has tool steel cutting edges and forming parts forged to a wrought iron plate which in turn is mounted on a cast iron base. The punch is also tool steel forged to a wrought iron punch, giving an economical construction by putting tool steel only where it is needed.

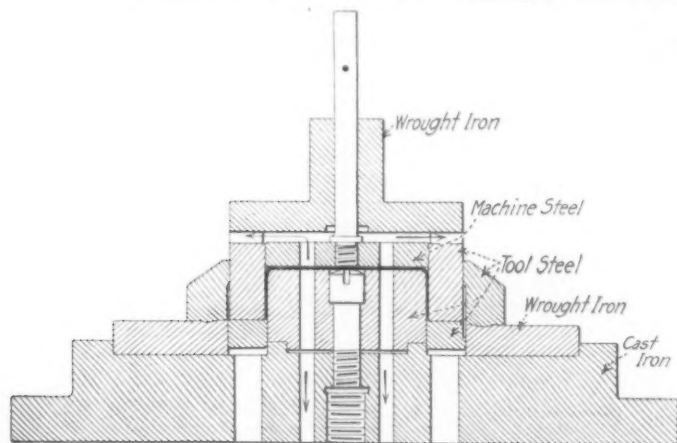
When the die is in operation the punch acts both as a blanking and forming tool. As it descends it cuts the blank to the required diameter; continuing down it forms the metal around the tool steel plug. During this forming operation the draw ring, which is carried on the tops of four steel pins, 3/4 in. in diameter, which in turn rest on rubber buffers, is forced along down with the punch. This compresses the rubbers, which exert an upward pressure on the blank,

\*Acklin Stamping Co., Toledo, Ohio.



Successive Operations Involved in Drawing Shift Lever Dome. Starting with the upper left they are: 1. Combination cut and draw; 2. Draw to 1 5/16 in. deep; 3. Reduction of nose; 4. Further reduction of nose; 5. 6. Still further reduction of nose and cutting of hole; 7. Finish shape; 8. Trim; and 9. Cutting notch in side of neck

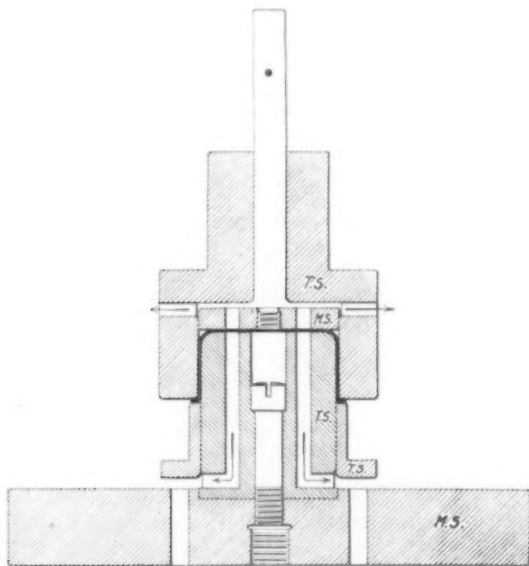
holding it firmly during the draw, and as the punch ascends it strips the cup off the plug. At the top of the stroke of the ram the positive knock-out pin forces the cup out of the punch if it sticks. Vents in the plug allow the air confined under the stamping during the descent of the punch to escape. If not allowed to escape the air would cause the stamping to buckle and



Combination Die Used in First Operation

distort. An air vent is also provided through the punch.

The second operation is to still further draw the cup to depth of  $1 \frac{15}{16}$  in., and to a diameter of  $3 \frac{3}{4}$  in. The die used is mounted on a machine steel base, the forming parts being of tool steel, hardened and ground. The stamping from the first operation is placed over the draw ring and the punch forms the cup to a smaller diameter around the plug, at the same time forcing the draw ring down, which compresses the rubbers under the die. The plug and punch are provided with vents. On the upward stroke the draw ring follows the punch and thus strips the cup off the plug. At the top of the stroke the positive knock-out



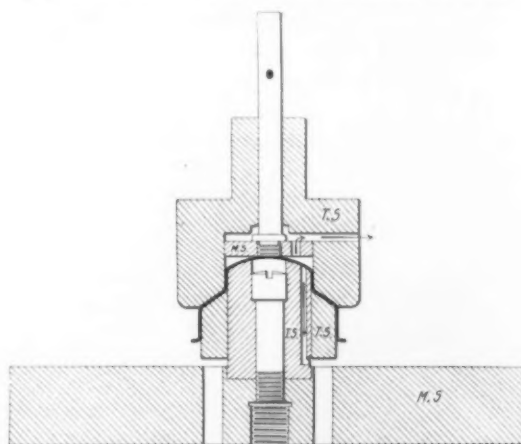
Die Used in Second Operation

arrangement forces the cup out of the punch and it is caught by the operator on a wooden paddle and thrown to one side. This operation was performed on a No. 84 Bliss press.

The base of the cup is now about the proper size, and all further rough reduction is done on the top of the piece. The third operation gives the nose of the piece its first reduction, making the overall depth of the cup  $2 \frac{5}{16}$  in. deep. The die is mounted on a machine steel base and all forming parts are of tool steel, hardened and ground. The punch is entirely of tool steel, as this is a more economical construction

because of its size than forging a tool steel ring on a cheaper base. The plug is held to the base by means of the  $\frac{1}{4}$ -in. screw passing down through its center, and the operation of the die is similar to the previous one. The stamping is placed over the draw ring and the punch forces the draw ring down and forms the cup around the plug to size. Four  $\frac{1}{2}$ -in. pins transmit this downward force to the rubber buffers under the die which compresses them. On the up stroke of the punch the expanding rubbers force the draw ring to follow upward and thus strips the cup off the plug as the ram nears the end of its upward stroke. The positive knock-out pin pushes the cup from out the punch. A Bliss No. 84 press is also used for this work.

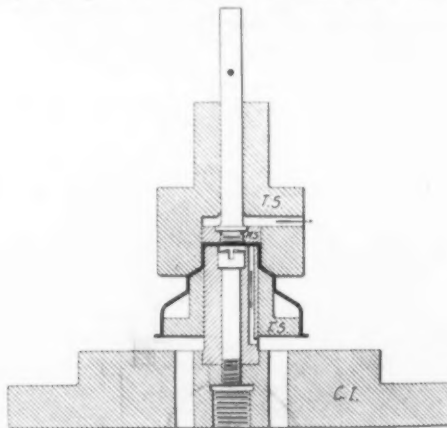
Further reduction of the nose of the cup to prepare it for the final stamping is the object of the fourth operation, which renders the cup  $2 \frac{1}{2}$  in. deep, or an increase in depth of  $\frac{3}{16}$  in. A Bliss No. 84 press is used for this work. The die is mounted on a base of



Die Used in Third Operation

cast iron, the tool steel plug being held securely to it by means of recessing the plug into the base and also by a  $\frac{1}{4}$ -in. screw. The punch is tool steel. As in the previous die, a vent is necessary in the plug and in the punch. The die operates similar to the previous ones as to the draw ring, being on the tops of pins supported by rubber buffers. These give the pressure necessary to strip the work off the plug after the punch ascends while the positive knock-out frees the stamping from the punch.

The fifth operation is the last of the preparatory ones to bring the stamping to the rough cone shape. The size of the nose is still further reduced, and the stamping brought to a depth of  $2 \frac{3}{4}$  in. This die is

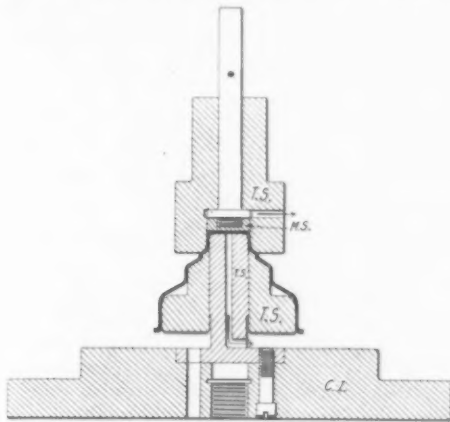


Die Used in Fourth Operation

also mounted on a cast iron base. The plug is held to the base by means of a  $2 \frac{3}{4}$ -in. screw, and the recessing also helps to hold the plug to the base. The punch and draw ring are tool steel. The operation of the die is exactly similar to that of the preceding dies, and is fitted with the conventional pressure attachments

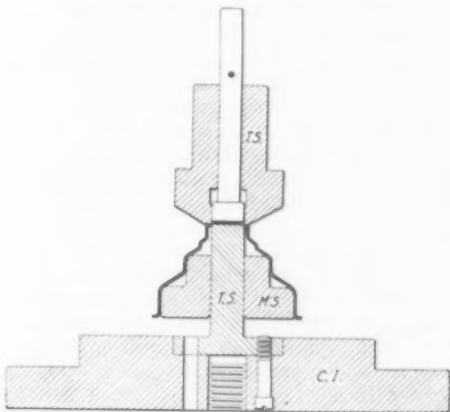
and vents. A Bliss No. 84 press was used in this operation.

Cutting out the center of the top of the stamping is performed in the sixth operation. This prepares it for the flanging operation which follows, and is combined with the finish-shape operation. The die used



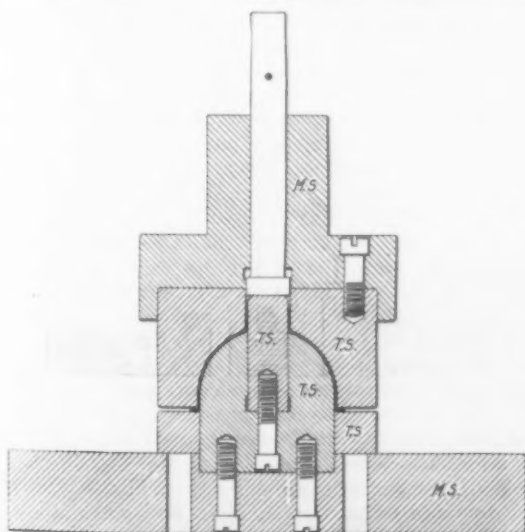
Die Used in Fifth Operation

cuts the hole from the inside out and is mounted on a cast iron base. The plug is held to the base by means of the recessing and the two  $\frac{3}{8}$ -in. screws. The plug, draw ring and punch are tool steel. The hole cut is  $\frac{3}{4}$  in. in diameter, which is the size of the plug, the punch being several thousandths larger for clearance.



Die Used in Sixth Operation

The die operates like the ones previously described, except in this case the slug cut out is the part which is forced out of the punch by the positive knock-out. The stamping together with the draw ring slides up and down around the tool steel plug. The stamping is now ready for the flanging and finish-shape opera-

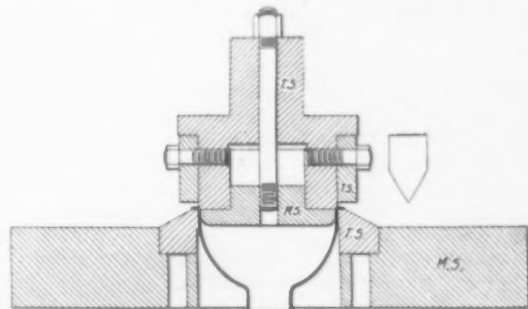


Die Used in Seventh Operation

tion. A Bliss No. 73½ press was used for this work.

Before the next operation the stamping is dipped in a solution of five parts water and one of muriatic acid and then annealed to a cherry red. The acid loosens the scale which invariably forms on steel when heated to a red heat, and can thus easily be removed by tumbling. The removal of this scale is rather essential, as it causes unnecessary wear on the dies. The annealing releases all internal strains set up in the metal and prepares it for further drawing.

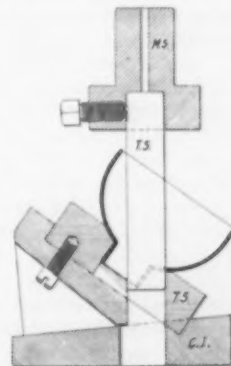
The seventh operation is the sizing one and brings the piece to the proper size and shape, also flanging the neck. The die used is mounted on a machine steel base, which holds the plug. The punch is machine steel except for the tool steel forming part which is fastened to the plug by the four  $\frac{1}{2}$ -in. screws. The draw ring is tool steel and rides on the tops of four  $\frac{3}{8}$ -in. cold rolled pins which rest on rubber buffers under the die. The plug is constructed in two parts to facilitate the making of it. This center part of the plug does the flanging of the center hole, thus giving



Die Used in Eighth Operation

the die two distinct duties: that of forming the sides of the body and flanging the neck. The standard knock-out arrangement in the punch forces the work out of the punch at the top of the stroke of the ram. This work requires considerable force and a Bliss 74½ press was used satisfactorily. This sizing operation brings the piece to shape and leaves the surface uniform and smooth enough to take the nickel-plate finish without any machining or buffing.

Trimming off the flange that remains around the base of the stamping is the function of the next or eighth operation, which is performed with the stamping



Die Used in Ninth Operation

in an inverted position. The diameter of the base is not changed, it still being  $3\frac{3}{4}$  in. outside diameter or  $3\frac{11}{16}$  in. inside diameter. The punch is fitted with two small trimming edges placed diametrically opposite each other, and with their cutting edges at right angles to the cutting edge of the die. The purpose of these edges is to cut through the rings of trimmed off scrap which accumulate around the outside of the punch. At each stroke of the press a ring of the scrap is cut off by the edges and another ring is added. The body of the stamping acts as a gage for centering it in the hole of the die and in addition the machine steel



plate on the end of knock-out pin enters the inside of the stamping ahead of the cutting edge of the die and thus centers the piece concentric with the cutting edge of the die. The machine steel plate is held out in advance of the punch by the  $\frac{3}{4}$ -in. compression spring placed around the knock-out pin inside of the punch. The cutting edge of the die is constructed with four high spots equally spaced around its circumference, while the cutting edge of the punch is flat. The high shear points on the die allow the punch to cut through the metal with more ease and with less impact. After being trimmed the stamping falls on through the die. A Bliss No. 73 $\frac{1}{2}$  press was used for this operation.

The ninth and last operation finishes the piece by cutting a notch in one side of the neck. A No. 52 Bliss press was used and the die mounted on a cast iron base made from a special pattern. The plug is recessed in the base at an angle of 35 deg. The punch is a standard one of cast iron, in which is held a tool steel cutting punch by the  $\frac{1}{2}$ -in. set screw placed at an angle of 2 deg. The plug is machine steel with the exception of the tool steel which is fitted in at the top to provide a hard cutting edge for the punch.

The method and dies described have proved entirely satisfactory and an average production of 4000 finished stampings per 10-hr. day has been maintained.

## Molybdenum Structural Steels and Their Application\*

Open-Hearth Practice—Blooming and Finish Rolling  
\* Characteristics—Features in Thermal Manipulations

BY MARTIN H. SCHMID

**T**HAT the earliest experiments in molybdenum steels were confined largely to tool and magnet steels is not surprising in view of the fact that molybdenum was not then known to exist in sufficient quantities to warrant its consideration (other than purely academic interest) for commercial structural requirements. It is surprising, however, to note that in spite of the then limited available supply of this alloying element, the earlier experimentation on structural steels was in most cases confined to material of a much higher molybdenum content than is considered advisable at the present time. It is also surprising that practically all study was confined to its direct effect in the ternary steels instead of more research on its indirect effect on additive and intensifying effect on other elements in the quaternary and more complex alloy steels. It is, of course, quite possible that research along the latter lines was pursued but not published. It is a fact, however, that exhaustive research directed by C. H. Wills established the practicability of the commercial application of molybdenum as an alloying element in the various types of alloy steels.

Most of us can recall the time when the selection of alloy steels for various products was based almost entirely on the physical characteristics obtainable. There are now a variety of types of alloy steels in which there is very little difference in physical properties, all of which will yield the necessary strength and factors of safety in the finished product. The present consumer of such steels, having at his command many types that are satisfactory so far as static and dynamic qualities are concerned, is influenced in his choice of material by the efficiency of the product in proper and economical functioning in the various manufacturing processes. From the manufacturing standpoint he wants a steel which first of all has a tendency toward the minimum of inherent defects; he wants a steel which gives the most efficient response to the various thermal and mechanical manipulations to which it is subjected in the numerous stages of processing from the raw material to the finished product.

### Manufacture of Molybdenum Steel

That the manufacture of molybdenum steels is on a practical commercial basis has been well established. The first heat of electric furnace steel made by the United Alloy Steel Corporation was tapped Dec. 3, 1917, since which time this company has made in excess of 10,000 tons of ingots of various types, comprising carbon molybdenum, chrome molybdenum, chrome-nickel-molybdenum, etc. The first open-hearth heat of molybdenum steel was tapped by this company May 24, 1918, and since that time approximately 25,000 tons

have been produced. No serious difficulties are experienced in the various stages of processing, from melting and casting on through the rolling and cold drawing operations.

Molybdenum is available as a furnace addition in two forms, as ferromolybdenum and as calcium molybdate. In the former form it is most conveniently obtained and used with a molybdenum content of 50 to 60 per cent, although our company has very successfully used 70 to 80 per cent ferromolybdenum. In the form of calcium molybdate we have a lower percentage of metal, averaging 35 per cent.

We have thoroughly investigated all methods of adding ferro-molybdenum and have adopted as standard practice its addition in the furnace as the charge is melting because of the better diffusion and higher degree of uniformity in the finished product together with higher efficiency or minimized loss of the alloy. It has been our experience that calcium molybdate is most satisfactorily added in sacks as the scrap charge is melting down, being so placed as to permit the partially molten scrap to cover or envelop the salt. Greater care is necessary with calcium molybdate than with the ferro-alloy in order to prevent the draft of the furnace from pulling off part of the powdered molybdate addition and carrying it to the furnace walls, ports and checker chambers.

A valuable consideration is the utilization of molybdenum steel scrap which may be included in the furnace charge with a yield of approximately the same ratio as direct alloying additions.

The blooming and finish rolling operations on molybdenum steel require no special precautions other than those necessary on corresponding types of other alloy steels and the practice, measured in per cent of available finished product, is higher than in most types of similar properties. The tendency toward a minimum amount of inherent defects, both surface and sub-surface, is very pronounced, especially as compared with nickel and chrome-nickel steels.

While molybdenum evidently has no deoxidizing or scavenging effect it has at the same time no deleterious effects on the working of the steel and a chrome-molybdenum steel should process as efficiently as the same type without molybdenum, and a chrome-nickel-molybdenum should process as efficiently as the same type without this additional alloy. Molybdenum steels as a class may be considered as more free from seams than nickel and chrome-nickel steels of corresponding potential values. It would be absurd, however, to claim that such defects in billets heal up or roll out in finishing mill operations.

Wide temperature ranges are available for rolling and forging, and while there is no appreciable difference in the amount of scale, there is a marked advantage in the texture of the scale over that on nickel

\*From a paper read at the April meeting of the Washington (D. C.) Chapter of the American Society for Steel Treating. The author is metallurgist United Alloy Steel Corporation, Canton, Ohio.



steels. The scale is a loose, non-tenacious one, freely flaking from the steel, showing no tendency to roll into the surface and result in pitting.

#### Thermal Manipulations

Molybdenum steels as a class may be subjected to unusually wide temperature ranges for both hot working and heat treating. This applies particularly with respect to the more generally used chrome-molybdenum types which will satisfactorily withstand considerably higher temperatures than the corresponding types of nickel and chrome-nickel steels. Forging companies report that chrome-molybdenum steels flow better in the dies than other types, which advantage is probably due to a large extent to the use of higher working temperatures. I cannot conscientiously credit molybdenum steels with less scale loss but it is certainly true that less difficulty is encountered in forging operations on account of the ease with which scale loosens from the bars in carbon-molybdenum and chrome-molybdenum types. Cleaner forgings are obtained and tumbling and pickling charges are minimized.

The outstanding features relative to the heat treatment of molybdenum steels are the extremely wide quenching ranges available for practical heat treatment, the excellent penetrative effect of such treatment on large sizes and the broad drawing range causing but slight modification in physical properties, this due to the retarded disassociation and reversion to normal state upon heat application after quenching.

Data have been published by the Crucible Steel Co., the Carbon Steel Co. and the United Alloy Steel Corporation showing uniformity in static properties through a wide range of quenching temperatures, but without information as to comparisons on dynamic properties. To show that impact as well as static properties evidence no marked variation with quenching temperatures ranging from 1500 to 2000 deg. Fahr. inclusive, I have taken average results from a series of recent experiments in our laboratories on chrome-molybdenum steel analyzing as follows: Carbon, 0.27; manganese, 0.66; sulphur, 0.036; phosphorus, 0.018; silicon, 0.08; chromium, 0.83 and molybdenum, 0.42 per cent. The size treated was  $\frac{3}{4}$  in. round and all tests were drawn at 1050 deg. Fahr., after quenching in water at the temperatures indicated.

Quenching Temperature	Elastic Limit, Lb. per Sq. In.	Tensile Strength, Lb. per Sq. In.	Elongation, Per Cent	Reduction of Area, Per Cent	Brinell Hardness	Izod Value
1500	140,000	163,500	18.5	62.7	319	58
1600	139,500	161,700	17.0	63.1	321	62
1700	138,400	160,400	17.5	61.7	321	60
1800	138,300	158,500	18.0	61.5	319	61
1900	139,600	159,600	16.8	57.9	317	56
2000	140,000	157,000	17.0	59.0	317	55

Striking evidence of the penetrative effect of treating as well as the high drawing temperatures available for attainment of high physical properties is manifested in one type of chrome-nickel-molybdenum steel used for crankshafts and connecting rods in aircraft work. The analysis range of this type is carbon, 0.22 to 0.30; manganese, 0.50 to 0.70; sulphur, 0.035 max.; phosphorus, 0.030 max.; silicon, 0.10 to 0.20; chromium, 0.70 to 0.90; nickel, 2.75 to 3.25; molybdenum, 0.30 to 0.50 per cent. Physical results taken on a full size prolongation (approximately 4 in. in diameter) and averaged from 28 tests taken at random showed:

Elastic limit—130,000 lb. per sq. in.  
 Ultimate strength—142,000 lb. per sq. in.  
 Elongation in 2 in.—20.5 per cent.  
 Reduction of area—65.0 per cent.  
 Izod—67.  
 Brinell—303.

#### Mechanical Manipulations

The most important mechanical operations to which steel is subjected in the manufacture of the finished product are cold pressing, forming and heading, and machining. Efficient response in the operations involving cold flowing of metal effects savings in fabricating costs resultant from minimization of rejections in semi-finished and finished parts as well as maintenance costs on dies and tools. The merits of molybdenum steel for this purpose have been established through the results

obtained on carbon molybdenum and chrome-molybdenum types in the cold forming and pressing operations in the manufacture of automobile frames, die steel wheels and rear axle housings; through production of cold headed parts on the chrome-molybdenum types, and through cold upset bolts on the high carbon, chrome-molybdenum ball and race types.

The molybdenum steels have better machineability than other alloy steels of equal physical properties. This has been established by the production results obtained on several thousand tons processed into rear axle drive shafts and on which no machining difficulties were experienced on shafts heat treated to conform to a 300 to 400 Brinell specification. On a heat made by the United Alloy Steel Corporation for one of the large automobile companies and put into steering knuckles and front axles, we received a report to the effect that tool grinding costs were but one-third as high as on 3.50 per cent nickel steel of the same hardness and with corresponding shop production. Front axles with Brinells up to 340 maximum machined as well as chrome-nickel steel axles of 302 Brinell.

The scope of application of molybdenum steels appears wider than that of any of the other types of alloy steels. While the greater portion of the molybdenum steel manufactured to date has been used in automotive forgings and pressed metal parts, its excellent properties have likewise warranted its use in a variety of other parts, embracing railroad forgings and track bolts, armor plate, air flasks, agricultural implements, shovels, machinery forgings and piston rods, various wedge tools, etc.

#### German and Belgian Exports to India

WASHINGTON, May 31.—While American prices in themselves are at about the same level as those of Germany and Belgium for iron and steel products, American exchange is so unfavorable that American material is too high in rupees and the former two countries are exporting about 90 per cent of iron and steel going to India daily, according to a report conveyed to the Bureau of Foreign and Domestic Commerce by Trade Commissioner Batchelder. These exports, he advises, apply to structural steel, wire nails, and similar products. Much of the German and Belgium material, it is stated, is of poor quality, badly manufactured, cheapness being the only requisite.

#### Time to Study India

WASHINGTON, May 31.—Trade Commissioner Batchelder believes that interested manufacturers of railroad supplies should study the situation in India now, so as to be able to bid when the time comes. He is of the opinion that it will be too late to make investigations as to specifications and requirements when the bids are advertised. Some manufacturers are already looking into this matter, but in spite of the fact that demand for railroad supplies are great and the railroad situation is one of the most important features of India, not much interest has been displayed as yet, it is stated.

One hundred and fifty members of the Purchasing Agents' Association of Cincinnati, Dayton and Springfield, Ohio, were the guests of the American Rolling Mill Co., Middletown, on May 24. The visitors were shown through the East Side works and the operations explained to them by guides. They were guests at dinner in the company's dining room and in the evening were treated to a motion picture program which included an exhibition of the methods of steel making and the various finishing processes at the company's plant.

The Steel Fabricating Corporation announces the completion of its new works and general offices at Michigan City, Ind., and the removal to that city from Harvey, Ill., of its executive headquarters. The new plant with its 175,000 feet of additional floor space more than trebles the present capacity for the manufacture of Stefcu Readybuilt steel buildings.

## COLD ROLLED STRIP STEEL

Annual Production 700,000 to 900,000 Tons,  
With Automobile Industry Largest Consumer

The uses to which cold rolled strip steel is put have increased remarkably in recent years. This product, sometimes called flat wire or flat cold rolled steel, is adapted for nearly every purpose of drawing, stamping or rolling, where more expensive metals, such as brass, copper and aluminum, have been employed. Stampings made from cold rolled strip steel have also taken to some extent the place of castings, due to their lighter weight, finish and lower cost.

There are about 15 manufacturers of cold rolled strip steel in the United States and the annual production ranges from 700,000 to 900,000 tons. The automobile industry is the largest user.

Among the diversified uses which have been found for this product are the following:

Air rifles and parts	Keys
Automobile frames	Locks
Automobile head, tail and side lamps	Machine parts
Automobile parts	Mince knives
Automobile rims	Novelties
Bedstead tubing	Pads
Bells	Phonograph parts
Bicycle parts	Push plates
Buckle springs	Riveted hose
Buckles	Rolling shutters
Building hardware	Roller skates
Butt hinges	Sash lifts
Buttons	Sash locks
Carpet sweeper wheels	School desks
Cash registers	Sewing machine parts
Chains for automobiles, trucks, motorcycles, bicycles, machinery, etc.	Shoe eyelets
Clasps	Shoe horns
Clock springs	Shoe rivets
Cream separator parts	Shoe shanks
Door knobs	Show case parts
Drawer pulls	Side links
Escutcheons	Snap springs
Ferrules	Spoons
Forks	Spring hinges
Furniture hardware	Stampings of all kinds
Furniture molding and trimming	Stove edges
Garden trowels	Stove ornaments
Gasoline tubing	Stove rings
Go-cart trimming	Telephone parts
Gun parts	Typewriters
Hack saws	Tubing
Ice skates	Trunk hardware
	Watch main springs
	Watch parts
	Wire mats
	Wire chair rims

### Early Production in United States in 1871

The Stanley Works of New Britain, Conn., is reputed to be the first manufacturer of cold rolled strip steel in the United States. Its first cold rolling tests were made about 1871 with American and Swedish iron and crucible steel as the raw material. About two years later cold rolling tests were made on hoops and bands of open-hearth steel imported from England. These tests were made fully ten years before basic open-hearth steel was produced in the United States.

The experiments made by the Stanley Works demonstrated that cold rolled steel was much better adapted to the manufacture of hardware than any steel previously used. With the scale removed by acid pickling before cold rolling, it was found possible to produce a fine surface on the metal, which not only increased the life of the blanking and punching dies used but at the same time made the surface suitable for plating.

Eventually the use of cold rolled strip steel by the Stanley Works became so thoroughly preferred that this plant installed equipment to make all of its own steel and some in addition for other manufacturers.

Cold rolled strip steel is most frequently made from open-hearth billets, though Bessemer steel is sometimes used. After the billets are heated they are rerolled into thin strips or hoops and the steel is then put through a pickling process to remove the thin coating of scale formed by oxidation after hot rolling. From the pickling operation the steel is transferred to a cold rolling mill, where it is passed between brightly polished rollers until it is reduced to the desired gage and given luster or finish.

Cold rolled strip steel is finished in various degrees of hardness to suit different requirements of forming and stamping.

During the war cold rolled strip steel was used for

a variety of purposes for which it had not been used previously, among them the light Browning rifle magazine. A large tonnage of strip steel is used for making various kinds of tubes, also for a 30-ball cartridge clip for use in the Springfield and rechambered Lee-Enfield rifles. It was used for booster casings in gas shells during the war.

Complete doorknobs, door keys, knives and forks and bicycle lantern brackets illustrate the varieties of use of this form of steel.

### British Machine Tool Makers' Association

WASHINGTON, May 31.—Consul General H. H. Morgan reports from Brussels, Belgium, that 12 leading British machine tool makers have formed an association with a view to improvement in methods of manufacture and economy in production. They have found that the great variety of machines built by various firms did not contribute to a rapid and economical production, prompt delivery, improvement or a precise make and that, if all that could create rivalry between manufacturers were eliminated and machines constructed in series or in great numbers, it would be easier to answer the demands of customers. The sales phase of the organization is given considerable attention and will include demonstrations in exhibition halls.

### Magnesite in Manchuria

Japanese mining engineers engaged in mineral surveys along the South Manchurian Railway line state that there are extensive and well proved deposits of magnesite in Manchuria which are of great potential value, according to the *Trans-Pacific*. The magnesite is in fact too pure for making into the usual brick form without the admixture of 7 to 8 per cent of iron. Japanese own the larger part of the deposits but considerable areas are still in Chinese hands. Occurring with the magnesite are important talc deposits said to equal if not excel the best grade French talc deposits. The known deposits of both of these substances are all within from 3 to 10 miles of the South Manchuria Railway.

### German Method for Locating Minerals to Be Developed in the United States

The Schermuly Polarizator Corporation, 25 Broad Street, New York, has been organized to own and operate in the United States the divining rod system developed by Phillip Schermuly of Frankfurt-am-Main, Germany, and described in the article "New Process for Locating Mineral Deposits," by Herman A. Holz, in *THE IRON AGE*, Dec. 9, 1920. After Mr. Holz and his associates, with the assistance of John Hays Hammond, had brought Mr. Schermuly to this country, in January, 1921, the inventor demonstrated his process and apparatus to American experts, working on iron mining properties of Ladenburg, Thalmann & Co. in Wisconsin and Michigan, on gas and oil properties of the Philadelphia Co. in the Pittsburgh district and on some of the Louisiana and Arkansas oil fields. The field demonstrations are reported to have been successful, and the purchase of the American rights for this invention is the outcome. Ladenburg, Thalmann & Co. it is understood, are the controlling factor in the Schermuly Polarizator Corporation either directly or through affiliated corporations. Felix Vogel, mining engineer for that company, is president of the new corporation.

The May meeting of the Chicago Chapter of the American Society for Steel Treating was held Monday evening, May 16, 1921. The speaker, J. W. O'Leary, discussed "The Relation of the Steel Treater to Present Economic Conditions." The following officers were elected for the ensuing year: Chairman: H. F. Wood, metallurgist Ingalls Shepard Division, Wyman Gordon Co., Harvey, Ill.; vice-chairman: P. A. Lovgren, Standard Forgings Co., Indiana Harbor, Ind., and secretary-treasurer, Harry Blumberg, metallographist Illinois Steel Co., Chicago.



# Indexing and Filing Industrial Drawings\*

Systems Used by Five Prominent Engineers and Manufacturers Include Direct Filing and Card Indexes — Blue Prints Located Easily

— BY L. H. PARK† —

THE indexing and filing of drawings is one of the most complex problems of the drafting room. The time wasted in waiting for information contained on a drawing which cannot be located for various reasons, adds very materially to the drawing cost.

Five large engineering enterprises: The Wellman-Seaver-Morgan Co., the Grasselli Chemical Co., the Koppers Co., the Austin Co., and Arthur G. McKee & Co., have what to their minds are nearly perfected systems, adapted to their individual lines of work. All use

drawing, topically or numerically, in a card, or similar, index and then going to the drawing file.

When a drawing is wanted the file clerk needs only to know what works or warehouses and what departments are called for. Then he goes directly to the drawing file where this work's drawings are filed and he is able without delay to find the particular folder in which this drawing is located. It is then a matter of a few seconds to find the drawings. Briefly, the plan is as follows:

The files are first subdivided into works, warehouses,

Drawings and Tracings Are Kept Track of by Card Indexes. A and B are styles of cards used by the Wellman-Seaver-Morgan Co., while C and D are used by Arthur G. McKee & Co.

**THE WELLMAN-SEAVER-MORGAN CO.**

CONTRACT NO. \_\_\_\_\_ PROPOSAL NO. \_\_\_\_\_

SUBJECT \_\_\_\_\_ DATE \_\_\_\_\_

DRAWN BY \_\_\_\_\_

CHECKED BY \_\_\_\_\_

APPROVED BY \_\_\_\_\_

TRACED FROM \_\_\_\_\_

FOR \_\_\_\_\_ SCALE \_\_\_\_\_

67324

64-7-10 20M

Drawing No. \_\_\_\_\_

Date \_\_\_\_\_

Signed \_\_\_\_\_

Draw No. 12280 Cont. No. 970

Firm CAMBRIA STEEL CO., JOHNSTOWN, PA.

Subject BLAST FURNACE TOP  
LARGE BELL

DRAWN BY \_\_\_\_\_ REVISED \_\_\_\_\_

TRACED BY \_\_\_\_\_ DATE \_\_\_\_\_

CHECKED BY \_\_\_\_\_ SCALE \_\_\_\_\_

ARTHUR G. MCKEE & CO.  
CLEVELAND, OHIO

Form No. 10 2-18

CAMBRIA STEEL CO. F.D. 3096

G.A. OF BLAST FURNACE TOP

CAMBRIA ST. CO'S DWG #5683

their tracings for reference, except the Austin Co. and the Koppers Co., who use both tracings and blue prints. In all cases the drawing sizes are approximately the same, each having the full half and quarter sizes. The Wellman-Seaver-Morgan Co. has one size smaller, which is about one-eighth size, this being used for drawing room standards or details of parts which can be used variably.

The system of the Grasselli Chemical Co., manufacturer of the heavier chemicals, has been developed to suit its particular requirements. Its drawing records cover buildings and equipment for chemical manufacture in industrial plants and also the drawings of warehouses and other equipment. This is what may be called a direct system, where chief reliance is placed upon the drawing files themselves rather than upon going through the regular channel of looking up a

laboratories, etc. In the case of warehouses, where a large number of drawings is not required, one folder is sufficient. For a large plant or works where there are a number of different departments manufacturing different products, files are provided for each department. When the number of drawings in any department becomes too great for one file, subdivisions are made under subtitles of "buildings," "equipment," etc. A record is kept of the drawing numbers as allotted. One main number is given for each file and then the sheets are numbered numerically as allotted. For instance: The file may be given No. 5000, and as drawings are made they are numbered 5000-1, 5000-2, etc. In grouping the drawings after completion, all drawings numbered 5000 would be grouped in the one file.

The Graselli company's custom is to file the tracings in folders for reference use. This is not a common practice, but its experience has been that the tracings stand this kind of service very satisfactorily, eliminating the necessity of having an extra set of blue prints and doubling up the file capacity. In addition to the tracings, study drawings and blue prints of outside manufacturers, who supply machinery and other

\*Read before the Cleveland Engineering Society, Cleveland, March 8.

†Chief draftsman Arthur G. McKee & Co., Cleveland. The following co-operated with the author: O. D. Conover, Austin Co.; Franklin Moeller, Wellman-Seaver-Morgan Co., and W. R. Carson, Grasselli Chemical Co.



equipment, are included in these folders so that the folder for a department becomes a complete record. No topical record is kept of the drawings in books, cards or otherwise—the only record kept outside of the drawing files themselves being a numerical record on which the titles of drawings are kept and the dates when made as the numbers are assigned to the drawings and files. It is the practice, in addition to general reference files which are kept in the drawing room, to keep a complete set of all blue prints in a vault. These blue prints are filed in a manner similar to the regular drawing files, although lack of space at the present time prevents this. Vault records are kept at the Cleveland plant, which is about three miles from the downtown office, and this makes it impossible to use the vault blue prints for reference. Altogether they have about 1300 drawing files and 45 000 drawings.

The Wellman-Seaver-Morgan Co., builder of a widely varied class of heavy machinery, uses the following system:

#### One Man in Charge of Filing and Indexing

One man has charge of the filing and indexing on account of the great number of tracings and the limited amount of filing space. The large tracings are filed in drawers which will accommodate 200 sheets. Drawers for half size tracings are partitioned to contain 400 sheets and cross partitioned for quarter size, to contain 800 sheets. All sheets are filed numerically, which necessitates considerable care in removing and filing those tracings which are near the bottom of the drawer. They have adopted a plan for filing the eighth size sheets which is very good. These small sheets are placed in folders and filed vertically in long, deep drawers which make it very easy to remove and file. The wear and tear on the tracings is reduced to a minimum.

The indexing is by the card system. In the lower right hand corner of the drawing is the title block containing the contract number, title of drawing and drawing number. A card (A) is filled in with the same information as appears in the title block and is filed under the contract number. Entrance is also made in a drawing record book in which the numbers run consecutively regardless of contract. Opposite the number which corresponds to the number on the drawing is entered the title of the drawing, the date the drawing is made and the contract on which it applies.

The system is carried further by indexing the parts on a drawing. For example, suppose there is a 3 x 6-in. bearing bracket detailed on the drawing, the clerk in charge of this card index would sketch the bracket on a card and file it under the head of "bearing bracket" and in a subdivision under "3 in. dia." This card is 3 x 5 in. and has recorded thereon the drawing and pattern numbers. This index is used to prevent duplication of patterns.

After ascertaining the drawing number from the card index, a slip is made out by the party desiring the tracing (B) having thereon the drawing number, the party's name and the date. This slip is filed in the vault when the tracing is given out. These slips are filed numerically in a rack. When a tracing is not in the file the clerk can tell immediately where it is.

The system adopted by the Koppers Co., Pittsburgh, engineer and contractor for complete by-product coke oven plants, during the war and still in use, is well worthy of note. This company, employing between 300 and 400 draftsmen and making several hundred drawings per week, needed the most efficient system that could be worked out.

#### Carriers Deliver Tracings from Central Vault

All tracings are filed numerically in a central vault. A complete buzzer system is provided, buttons being located on every third or fourth drawing table with the indicator inside the vault. Office girls act as carriers. When any party in the drawing room desires a tracing he makes out a slip, similar to that used by the Wellman-Seaver-Morgan Co., and presses the nearest buzzer button. A carrier calls for the slip and delivers the tracing. Should the tracing be in use, the possessor either allows it to be taken or advises about when it can be obtained. If the time is too long for

the other party to wait he is given a blue print, several of which are always kept on file. His requisition slip is then changed to read "blue print" instead of "tracing." A complete and reliable check is kept as to the location of tracings and prints at all times. When a change or revision is being made on a tracing, the vault is informed and immediately all prints from that particular tracing are destroyed. All tracings are collected nightly, placed in the vault in bundles having attached thereto a tag bearing the party's name. These are delivered to the respective parties the next morning.

The system adopted by the Austin Co. has been developed to meet the needs of the main office and each of its branch offices. In some cases the branch offices are primarily sales offices while others have their own engineering departments. As each of these departments operates under the general engineering department, it is necessary that the engineering and filing of drawings be well systematized. For other reasons, such as standardization of buildings together with their many details, it is proper that the reference drawings be in blue print form.

#### Standard Drawings Filed Directly

For work that is primarily standard, special filing racks are used for containing standard prints for individual drafting room requirements. Similar prints are placed in special folding cabinets in the sales offices; all of these prints are filed flat and in groups of about one dozen and hung in a vertical position in racks. No card system is used for indexing these drawings as they are filed numerically according to the standard building for which they pertain. Should any draftsman require the use of these drawings it is his privilege to remove them from the rack without inserting a card showing their removal. This is not true, however, for other than standard drawings. For these a general card index system is used. All drawings are numbered and indexed according to contract number and the serial number according to the classification of the work involved—for example, general drawings, structural details, heating, lighting and equipment drawings of certain numerical numbers which immediately indicate the purpose of the drawing in question.

For the large contracts which require a number of drawings and the likelihood of furnishing blue prints to various departments, as in a case of revision, a complete record is made on a form sheet on which is shown the record of drawings, their numbers, date of approval, record of prints furnished, revisions and other necessary information for each job.

Because of the great variety of work performed in the various drafting rooms the preparations of drawings are made according to which department they are to serve.

The development department takes complete charge of any new standards or other drawings to be used by all departments such as engineering instructions as they pertain to design, estimating, construction, sales, etc. The indexing and filing of all drawings included in this department are maintained and controlled exclusively by this department. Blue prints of drawings thus prepared are sent to the various departments for their files. Obsolete drawings, if any, are replaced correspondingly.

The material sales department controls the engineering pertaining to buildings sold for shipment and not for construction. This department maintains the indexing and filing system somewhat along the lines of the other departments mentioned, but is different in many respects, particularly as to the lettering and numbering of drawings. Like other departments, information serviceable for district offices is supplied to the general department for the proper filing and relay according to their instructions.

The sales offices are supplied with vertical cabinets for filing blue prints according to contract or job numbers as well as the standard drawings which are supplied by the general department. These drawings are numbered numerically for each contract and, except for very large jobs, it is not necessary to maintain the card index system. The cabinets are so arranged that the front part is a folding drawing table and when

entirely closed can be used for a side table as office furniture; too small, however, for a reference table.

The engineering departments in the various cities have separate filing systems for their own jobs as well as for drawings received from the general department and standard drawings furnished by the development department, the card index system, mentioned before, being used for the records.

In each of the engineering offices there is a vault with cabinets of the drawer type for filing current drawings, including those up to one year old, since the buildings are guaranteed for one year. Ample filing space is allowed for drawings until this period expires.

In addition to these filing cabinets, there is a reference room of sufficient size and with proper reference tables for general use. This eliminates the removal of many drawings from the drawing room. After drawings are returned for filing they are placed in a drawer specially designated for this purpose from which the filing clerk takes them to their proper file.

A separate card index system and other records are kept for drawings of finished jobs or others which are to be filed in the permanent storage in the vault. These drawings likewise are placed in cabinets of the drawer type, the folders in each drawer containing not more than 20 tracings. Blue prints are filed in separate filing cabinets in a similar manner.

In case a tracing or blue print is removed from the vault, a special card which records the removal is placed in the filing cabinet. The placing and removal of these drawings is handled by a special filing clerk. Foreign drawings are handled and recorded similarly except that the drawings are filed according to the job unless they are standard or general drawings serviceable for other jobs, in which case they are filed in special cabinets for the purpose, cross index filing system being used. The work of supervising the issuance and maintenance of the indexing and filing systems comes under the jurisdiction of the chief draftsman.

The system in vogue with Arthur G. McKee & Co., engineers and contractors for complete blast furnace plants, steel plants, sintering plants, etc., is practically the same as that used by the Wellman-Seaver-Morgan Co. as regards the filing of tracings except that only half the number is filed in each drawer. At one time McKee & Co. were cramped for filing space; tried filing tracings the same as the Wellman-Seaver-Morgan Co., that is, 200 full-sized tracings per drawer, etc. They found, however, that the tracings were depreciating so rapidly that steps were immediately taken to double the file capacity.

#### McKee & Co. Use Cards of Three Colors

They use three colors of cards for the tracing index; all cards being of the same form (C), yellow cards for the contract index, white cards for the subject, or title, index and blue cards for the client index. When work on a new contract is started in the drawing room, a blue card is filled in, giving name and location of the client and a description in general of the work.

When a draftsman begins work on a drawing, he will go to the card index and take out two blank cards, one yellow and one white, each of which has the drawing number stamped thereon, fill in the client's name and location or where work is to be done and the title of the drawing. These two cards travel with the drawing until the check print is made, at which time they are filed under contract number in the unfinished index. When the checker has signed the drawing he takes the two cards from the unfinished index, signs both, attaches them to the tracings, where they remain until detached by the chief draftsman when ordering prints for the purchasing department. Cards are then filed in the finished drawing file by the file clerk.

All who use the title or topic index have undoubtedly had more or less trouble at times in locating drawings by title. McKee & Co. have an iron-clad rule that all titles must be edited by the chief draftsman, the idea being to make them as concise and descriptive as possible, in order to reduce to a minimum the possibility of misfiling index cards. When an existing drawing is reused, a yellow card, not having a drawing number thereon, is filled in complete, including the number on the drawing. The new contract number is then added to the

existing white or title card. A drawing record book, similar to that of the Wellman-Seaver-Morgan Co., is also used—as a numerical index only.

Foreign prints, or clients' and manufacturers' prints pertaining to a contract, are filed in individual drawers while the contract is alive. When the contract is finished they are cross indexed for subjects and client or manufacturer and placed in a permanent file. Plain ruled white index cards are used for these prints. (D.)

For ready reference to standard parts McKee & Co. use the scrap book system. The scrap book is a large pasteboard binder having at the hinge a number of gummed edges to which blue prints are attached and will accommodate about 50 large size prints. These books are filed in a horizontal compartment case, each compartment holding four books. Contents of books are plainly marked on the hinge.

Because the vault is located centrally in the drawing room, the draftsman, after ascertaining the drawing number, will go there and help himself. If, however, the number is unknown, he will write on a slip of paper the information necessary to find the number from the card index; give this slip to the file clerk, who will deliver the drawing.

#### A German Opinion of the Basset Process

At a meeting of the German Iron Masters' Association last winter an address was delivered by Doctor Wüst, director Kaizer-Wilhelm Institute for Iron Research at Düsseldorf, Germany, on the process of direct smelting of iron ore into steel. His remarks, as reported by the London *Ironmonger*, are of interest just at this time because of the publicity given to the Basset process and were as follows:

He traced the development of the various iron-making processes, and referred to the Basset direct smelting process, of which there has been so much talk lately and which claims to be able to produce iron 70 per cent cheaper than it can be made in the blast furnace, and to save 80 per cent in the cost of installing the plant. Dr. Wüst showed by temperature calculations that a revolving furnace under the Basset process could turn out only one-fifth of the iron produced by a blast furnace of the same capacity in the same time, and declared that the new process was not at all likely to replace the present indirect method.

#### Westinghouse Earnings Increase

Gross earnings of the Westinghouse Electric & Mfg. Co. from sales billed for the year ended March 31, were \$150,980,000, which is an increase of \$15,000,000 over the gross earnings of the previous fiscal year. The manufacturing and selling cost was \$138,774,000; and the net income available for dividends was \$12,618,000, or 16.8 per cent on the company's entire capital stock. Dividends at the rate of 8 per cent per annum were paid during the year on both the preferred and common shares of stock. There is included in the cost, \$5,315,000 for depreciation and adjustment of inventories, which were valued as of Dec. 31, 1920, at cost or market value, whichever was lower. An appropriation of \$5,000,000 from surplus for a special contingent reserve has also been made to provide for further possible shrinkages and adjustments in the inventories. The property and plant account shows an increase over the previous year of \$9,361,000. The amount of unfilled orders on hand April 1, 1921, was \$65,621,000.

The combined profit and loss account of constituent companies of the British Empire Steel Corporation, Ltd., for the year ended Dec. 31, as filed with the New York Stock Exchange, showed a profit, after Government war taxes, interest, depreciation and all other expenses, of \$6,235,127. Sales and other revenues amounted to \$69,681,342 and cost of sales, etc., \$58,865,096. Cash showed \$1,261,884, notes receivable \$429,171, accounts receivable \$12,160,127, and inventories \$18,480,185.

Wages of employees, including officials, of the Advance-Rumely Co., maker of farm machinery, Laporte, Ind., have been reduced 10 per cent. The company has plants at Battle Creek, Mich., and Toronto, Can., also.



# Steel Direct from Ore By Moffat Process

Reduction in a Metallizer and Conversion Into Steel in Electric Furnaces—Recent Changes in an Older Canadian Method

BY W. F. SUTHERLAND\*

THE successful utilization of low grade iron ores is a problem demanding and receiving much attention from those in the iron and steel industry. While high iron content ores of excellent quality are not by any means becoming scarce, yet their exhaustion is within measurable distance and the use of inferior quality ores is thus approaching the status of an economic necessity. Ores of high metallic iron content, about 65 per cent and over in the crude state, are becoming increasingly difficult to obtain in the United States and Canada within a reasonable transportation distance of any market. One of the largest companies in the United States catalogues the product of 30 odd mines, without showing one such ore; seven, however range between 60 and 62 per cent. Outside the Helen and Magpie mines of the Algoma Steel Corporation, the Atikokan Iron Co. and the Moose Mountain mine of the Moose Mountain, Ltd., the ore bodies in the older and more populous parts of Canada are not large and are of low grade as a rule.

The electric furnace has offered an attractive field for investigation and much research has been carried on in the United States, Canada and other countries, particularly Sweden, with the end in view of adapting it to the production of iron and especially steel from ore direct. The Swedish shaft furnace is too well known to need detailed description, but it may be mentioned that it suffers from two serious defects in common with the majority of the processes so far developed; that of being able to use only a limited quantity of fines and that of producing a high carbon iron upon which further refining must be carried on if steel is desired. Aside from this example other processes have been developed with little success owing to their inherent metallurgical or operative defects or to the expensive nature of the process employed.

## Earlier Moffat Processes

One of the earliest and most successful commercial plants for the reduction of iron ore into steel with the aid of the electric furnace was that developed by James W. Moffat of Toronto and described by A. C. Dalton in *THE IRON AGE*, Oct. 15, 1914, and Nov. 18, 1915. In the first of these articles, the Moffat-Irving steel works was described together with the Moffat shower process and in the later article further descriptive matter was given relative to a number of heats which were run off, on various ores and under different conditions.

This older "shower" process consisted in essentials of the showering of ore fines together with carbonaceous reducing material through the reducing atmosphere of a brick lined shaft about 13 ft. high onto the hearth of a tilting electric furnace below. In their passage through this reducing zone the ore fines became more or less completely reduced to the metallic sponge state and were subsequently melted in the bath on the hearth. Steel of high quality was made of any desired carbon content, including carbon free iron and commercial castings and other products were made for a period of about seven years. In all slightly over 2000 heats were poured and the raw materials employed were roasted ores, magnetites, blast furnace flue dust and scrap melting stock at infrequent periods.

The process, while suitable for steel making, suffered from one or two disadvantages which precluded its successful adoption upon an extensive scale. Difficulty was encountered in the control of reduction and partially reduced oxides came through with disastrous re-

sults to the furnace linings through scouring slags. In operation also the process was no more economical than other more well known methods.

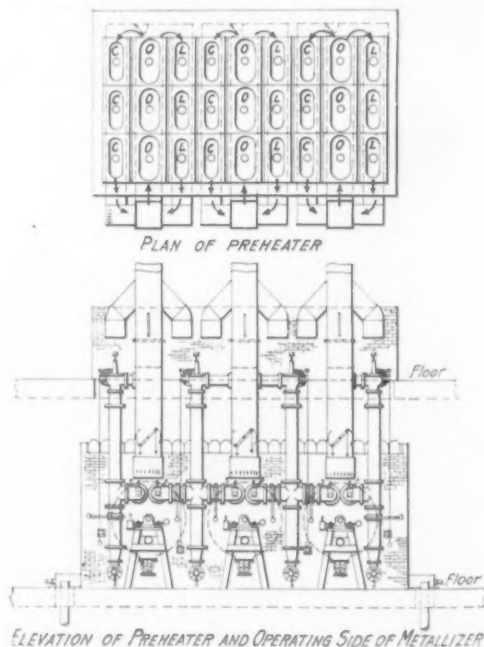
Mr. Moffat has recently developed a newer process in which the difficulties of the older one have been overcome and which is adaptable to a wide range of ores. Extremely careful use has been made of all the heat units available in the fuel and electric heat, with the consequence that not only does the consumption of electrical energy bid fair to be lower than that in the remelting electric furnace of to-day, but also the quantity of carbon needed for reduction is only slightly in excess of theoretical requirements as contrasted with present day blast furnace requirements of approximately pound for pound of pig iron produced.

In principle it employs two present known furnace processes, patented in combination. The first step is the reducing of the ore and its conversion into the metallic state, but in the form of sponge, so called. The next step is the transference of this sponge, either hot or cold, into the electric furnace, where it is melted down and finished.

## Earlier Treatments of Iron Sponge

Iron sponge is defined by Raymond as iron obtained by reduction without fusion. It is quite porous in form and its weight is about one-third that of cast iron.

A number of attempts have been made to use sponge



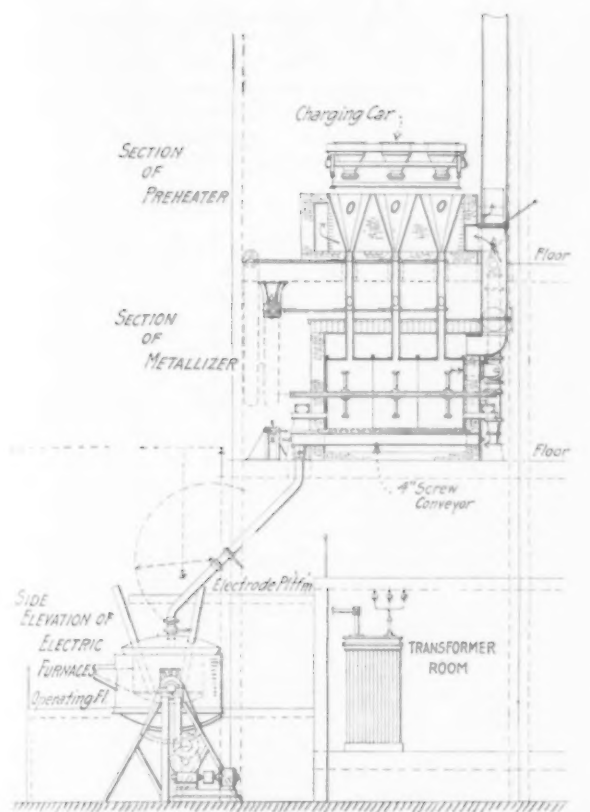
iron in various ways, a few of which may be noted. In Clay's process, the reduction was effected in retorts made of fireclay, the ore having been mixed with carbonaceous material, the heat being applied externally and the sponge iron product was then further heated and balled.

Newton also used a closed container in a somewhat similar way, heating it externally to a white heat for about 48 hours, and taking the product while hot to a puddling furnace or when cold to a crucible furnace. Such a prolonged operation was naturally an expensive one.

"Roger mixed ore with coal, and effected reduction

\*Toronto, Canada.





Section of the Metallizer Through the Iron Ore Retorts and the Mechanism for Delivering the Iron Sponge to the Electric Furnaces

in a rotating cylinder heated externally. This he located above his puddling furnace into which the resulting sponge was dropped, further heated, and then balled.

"The Carbon Iron Co. deoxidized iron ore in a reverberatory furnace provided with a carbonaceous hearth. The ore was mixed with retarded coke, which oxidizes very slowly, and the reduction of the ore was slow in consequence, but the sponge had the advantage of resisting oxidation better than by the other processes mentioned." (*Canadian Mining Journal*, April 2, 1919.)

The blast furnace has also been tried as a means of melting down iron sponge, but with complete failure, since the gases at the top of the shaft are too oxidizing and the sponge is converted back into an oxide again.

In all of the above where iron sponge was successfully made its melting down into the liquid state with avoidance of reoxidation was never achieved. This was due to the nature of the apparatus employed and to the impossibility of obtaining a sufficiently reducing atmosphere in the melting down period. It is at this point that the necessity and superiority of the electric furnace in this newer Moffat process is evident, since in it alone is a reducing atmosphere naturally formed.

#### Principle of the Moffat Process

The process as patented is a discontinuous one; that is, a batch of ore is fed into the reducing furnace, held there until reduced, then transferred to the electric furnace in the sponge state, there to be melted down and finished in the bath by well-known metallurgical methods. The discontinuous feature is one of the steps by which the making of steel is rendered possible since it approaches the step-by-step process of the open-hearth, Bessemer or other steel-making methods. This has been proven by long experience to be the only successful method of making steel, as the use of individual heats is necessary for the refining operations upon which the metallurgy of steel is based. The blast furnace is of course a mechanism which operates continuously and, in the line of electric smelting, previous attempts have endeavored to follow the same principle but without success, as might have been expected.

The electric furnace used is of standard pattern adapted to the receiving of the sponge iron through the roof and in operation no difference from the scrap melting furnace is evident save that the sponge iron is more readily melted and, being hot, less inductive disturbance caused in the melt-down period.

#### The Metallizing Unit

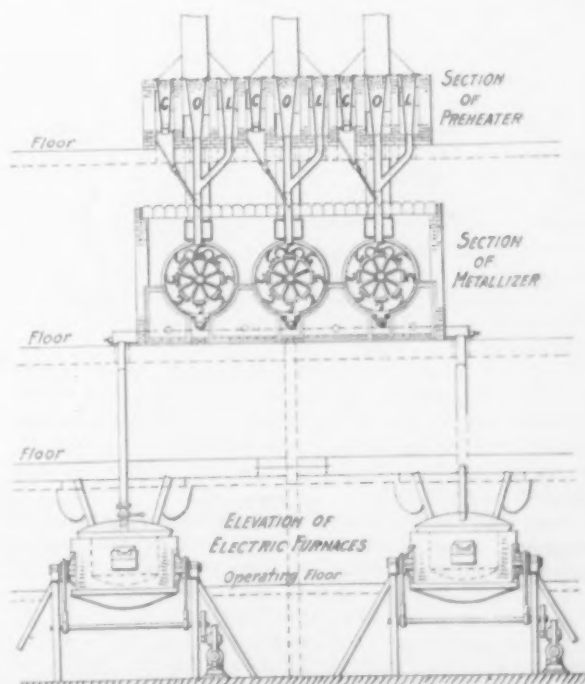
A metallizing or reduction furnace, also patented, has been designed as part of the process equipment and in it are found some novel features, necessary to the proper and economical production of the sponge iron required. In the accompanying illustrations the general arrangement of this reducing furnace is seen. A battery of three retorts is shown in a single setting, feeding two electric furnaces alternately. Each retort consists of a shell externally heated, with its interior entirely separated from the combustion space outside. Rabbling mechanism is shown adapted to the lifting and dropping of the charge repeatedly through the reducing atmosphere until reduction is complete and means are also provided for the introduction of ore and carbonaceous reducing material, and the withdrawal of the charge upon completion of reduction.

The transfer between the furnaces is so arranged that the sponge is delivered into the electric furnace without fear of reoxidation, this furnace being provided with a central opening above the bath so that the falling charge is centrally deposited on the hearth in such shape that it requires no further dressing with furnace tools.

The furnace is designed so that the charge can be held in it until the chemist reports complete reduction and a proper amount of carbon present for the further work to be done in the electric furnace. These necessities exclude furnaces with continuous charge and discharge such as rotary tube roasters.

The furnace is also adapted to the maintaining of an oxidizing atmosphere when desired, for the elimination of sulphur in the metallizer instead of by slagging off in the electric furnace.

Throughout the metallizing of the ore its physical condition as regards size remains the same. Ore fines charged in come out with little or no agglomeration. This result is a highly desirable one for the complete reduction of each individual particle as well as for ease of handling. Throughout the reduction of a batch of ore each individual particle is repeatedly exposed to the action of the reducing gas and, while quiescent on the floor of the retort, is kept to some extent in



General Arrangement of the Reducing Furnace of Three Retorts and the Elevation of the Two Electric Furnaces

motion by the rabbles. The continued movement of the ore particles in this way effectually prevents agglomeration.

#### Amount of Carbon Required

Theoretically to provide for complete reduction carbon must be introduced to the extent of from 24 to 26 per cent of the weight of metallic iron present in the ore. To this weight of carbon an excess must be provided up to about 35 per cent of the iron content, to provide for losses and the carbon content desired in the finished metal. The gases given off contain carbon monoxide and carbon dioxide in a more or less fixed ratio depending upon the temperature of reduction as well as other factors and they possess a high calorific value. It is in the utilization of the heat content of these retort gases that one of the greatest economies of the process exists, since theoretically it is of sufficient amount to supply the heat necessary for the continuance of the reaction. In practice an auxiliary supply is provided in the form of oil fuel, producer gas or otherwise.

Facilities are available for the complete control and recording of temperature, gas composition, etc., and operation in general can be controlled in as exact a manner as upon a laboratory scale.

The furnace is designed to receive the charge and carbon through a mechanism that practically prevents the entrance of more air than is contained in the voids of the pulverized ore. The charge is mechanically rabbled all the time and kept at a proper temperature for reduction; recording instruments are provided for the guidance of the operator in accurately controlling the heat entering the retort from the heating chamber, and for the analysis of the gas in the former, when desired; means are provided for taking samples of the ore without any reoxidation of it; peep-holes are arranged so that the operator may see a large portion of the interiors of the combustion chamber and retort, those used in the latter being air-tight; the furnace is capable of quick mechanical discharge into air-tight conveyors delivering the sponge into the electric furnace with a minimum loss of heat; the metallizer is also capable of holding the charge until the electric furnace is ready to receive it. Errors in the work of reduction by the operator are easily corrected.

Lime additions, for fluxing in the electric furnace preheated, can be charged and thoroughly mixed with the sponge by the rabbler and the waste gases to the stack can be used to preheat the materials of the charge to 250 or 300 deg. C. and also for the elimination of moisture.

#### Utilization of Inferior Ores

For blast-furnace use ores of a comparatively high iron content are required, and their physical condition must be such that they will stand transport and the crushing effect of the blast-furnace burden without an undue production of fines. For the successful reduction of ores other than these on a commercial basis, a process should take the ore directly after concentration or benefaction without nodulizing or briquetting. This is possible in the present process and the availability of ores suitable for the production of iron and steel is vastly increased. Magnetites requiring concentration, soft and low-grade hematites and carbonates, all are of economic importance in this connection.

Generally the benefaction of ores for the enrichment of the metallic content or the removal of injurious constituents leaves the ore in a state of fine subdivision and in this state it is admirably adapted for use in the metallizing furnace which forms the first step in this process.

Ores rich in metallic content and not requiring concentration can be used with equal facility, but require crushing and pulverizing to pass through a 10-mesh screen before they can be used in this process. Porosity of the ore, however, is of much importance and, in the case of a porous ore, particles passing through a five-mesh screen may answer to reduction as readily as those passing through a 10-mesh screen, though double the metallic content.

Ores low in metallic content should be pulverized

to the grain size, affording the best separation of the metallics from the gangue, even if all ground to pass through a 100-mesh screen. Concentration of these to a high grade is much more economical than charging a lot of rock matter into an electric furnace, with lime additions to obtain a suitable flux for it, melting it with an expensive heat and removing it as a slag.

#### Temperatures of Reduction

In the blast furnace hematite ( $\text{Fe}_2\text{O}_3$ ) begins to be reduced at a temperature of about 300 deg. C., and has been converted wholly into magnetite ( $\text{Fe}_3\text{O}_4$ ) at a temperature of 450 deg. C. This ore, with any natural magnetite in the charge, begins to be reduced to ferrous oxide ( $\text{FeO}$ ) at a temperature of about 500 deg. C., and the reaction is complete at about 590 deg. C. Ferrous oxide begins to be converted into iron ( $\text{Fe}$ ) at 700 deg. C. and the reaction becomes more rapid with increasing temperature and is complete when a temperature of 800 deg. C. is reached, all the iron being in a spongy metallic state. The sponge iron is all melted when temperatures of 1100 to 1300 deg. C. are reached, there being some variation in the heat required according to the analysis of the iron.

While the foregoing is taken from blast furnace practice as having been long established, the data tend to show the low temperatures at which sponge iron can be made and also point out the errors in the assumption recently made that higher temperatures than 900 deg. C. are required.

#### Power Consumption

With the Swedish electric furnace it requires about 1.1 kwhr. of power to produce 1 lb. of metal, and the metal is a white iron only. This is equivalent to 2.200 kwhr. per net ton. The metal is transferred while liquid to an ordinary electric furnace, where about 300 kwhr. of additional energy are required to finish the metal into steel, making the total energy consumption about 2500 kwhr. from ore to steel.

Properly reduced iron sponge melts as readily as cold scrap, which can be melted and finished in good practice with 700 or 750 kwhr. per ton. As the rock material remaining in the iron concentrates will frequently necessitate a larger amount of lime to secure a very basic slag, the weight of slag used in the iron sponge process will be somewhat larger than that in the scrap melting process—a fair average will be about the same as that for scrap steel, the greater amount of slag offsetting to some extent the already high heat content of the sponge iron and giving the figure of 700 to 750 kwhr.

#### Quantity of Ore Required

A 6-ton electric furnace (1500 kw. or 2000 hp.) will require the iron sponge made from about 10 tons of 63 per cent Fe concentrates per heat. With three 8-hr. shifts and experienced operators six heats should be made in 24 hr., if the plant is conveniently arranged. Taking the number of heats at six, a 6-ton furnace would thus readily produce 36 tons of liquid steel in 24 hr. and would require 60 tons of 63 per cent Fe concentrates for it. If the ore mined would need concentration of  $1\frac{1}{2}$  into 1 to produce 63 per cent Fe, one 6-ton furnace would use 90 tons per day of such crude ore.

The process and also the reduction furnace are patented in the United States, Canada and other foreign countries.

Funds available for the encouragement of scientific research, with income amounting to some \$50,000,000 annually, have been tabulated by National Research Council, 1701 Massachusetts Avenue, Washington. These special funds, trusts or foundations, for support of research, cover mathematics, physics, chemistry and biology, and their applications in engineering, medicine, agriculture and other useful arts. Information regarding funds for specific purposes may be obtained from the information service of the council.

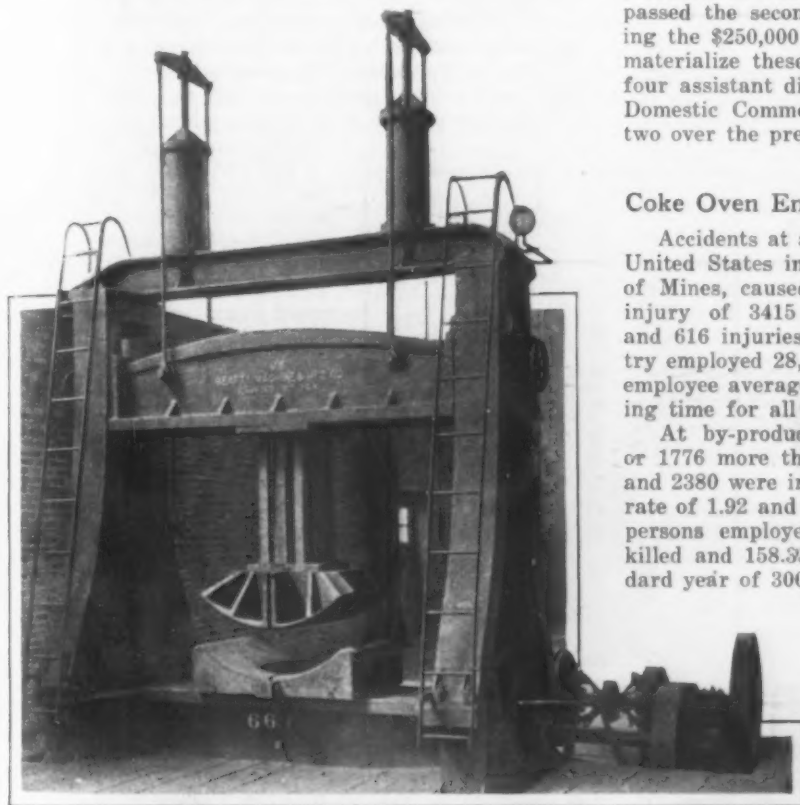


## Vertical Bulldozer

A vertical bulldozer especially adapted for railroad steel car construction and car repair work, being used for the pressing and forming of such parts as diaphragms, stakes, roof carlines, end sills, etc., has been brought out by the Beatty Machine & Mfg. Co., Hammond, Ind.

The machine is built in sizes up to and including 500 tons ram pressure, the distance between housings ranging from 8 to 12 ft. The vertical die space with stroke down and adjustment in center, ranges from 24 to 72 in., and the stroke from 18 to 24 in. There are 16 strokes per minute for the smallest size and 8 to 10 for the largest. The machine weighs approximately from 24,000 to 120,000 lb.

The features of construction include a heavy main



Vertical Bulldozer. The dies shown are used in forming plates for tank car tanks

shaft mounted through the bed or table casting, and full enclosure of main side gears and intermediate gearing. The side gears are joined to the cross head by connecting rods and at each end of the crosshead a 4-in. vertical adjustment has been provided for the purpose of eliminating loss of time in setting dies. The crosshead is fitted at both ends with bronze tapered gibs for adjustment in case of wear to the slides. The ram suspended from the crosshead is counterbalanced by two air cylinders located on top of the housing and jointed to both sides of the crosshead by connecting rods. The machine is equipped with forward and reverse clutches, permitting of reversal at any point of the stroke. All gears are of cast steel with cut teeth. It can be arranged for either belt or direct-connected motor drive.

### Plans of Durant Motors, Inc.

Expansion of Durant Motors, Inc., is indicated by the recent acquisition by W. C. Durant and associates of the Sheridan Motor Car Co., Muncie, Ind., and the organization of the Durant Motor Co. of Michigan, with capital stock of \$5,000,000, as a part of the new Durant group. Edward Ver Linden, vice-president, director and member of the executive committee of the General Motors Corporation, who has been president and general manager of the Olds subsidiary, at Lansing, Mich., has resigned and becomes president of

Durant's new Michigan corporation. A new plant will be constructed at Lansing, which is planned to have a capacity of 40,000 automobiles annually. It is said that the Durant syndicate contemplates the purchase of three or four plants now manufacturing motor parts in Muncie, near the Sheridan property.

## House Votes to Help Secretary Hoover

WASHINGTON, May 31.—Plans of Secretary of Commerce Hoover for extending the work of his Department through the creation of 12 industrial divisions, and the setting up of service committees along with other proposals for bringing about closer cooperation between the department and business interests of the country, were given the approval of the House of Representatives last week. That branch of Congress passed the second deficiency appropriation bill carrying the \$250,000 asked for by Mr. Hoover in order to materialize these plans, and also allowed Mr. Hoover four assistant directors of the Bureau of Foreign and Domestic Commerce, which represents an addition of two over the present number.

## Coke Oven Employment and Accident Statistics

Accidents at all coke ovens operated throughout the United States in 1920, according to the U. S. Bureau of Mines, caused the death of 49 employees and the injury of 3415 others, a reduction of 4 fatalities and 616 injuries as compared with 1919. The industry employed 28,139 persons during the year and each employee averaged 319 working days. The total working time for all employees was 8,976,214 shifts.

At by-product ovens 17,184 men were employed, or 1776 more than in 1919. Of these, 38 were killed and 2380 were injured by accidents, showing a fatality rate of 1.92 and an injury rate of 120.04 per thousand persons employed, as compared with a rate of 2.55 killed and 158.33 injured in 1919, based upon a standard year of 300 working days. The number of shifts operated at by-product ovens was 5,948,152, an increase of 894,661 shifts over the year before.

Coke ovens of the beehive type employed 10,955 men, which is 2378 less than the number employed in 1919. Accidents resulted in the death of 11 men and the injury of 1035, or 1.09 killed and 102.54 injured per thousand persons employed, as compared with accident rates of 0.92 killed and 125.96 injured in 1919. The total working time at beehive ovens was 3,028,062 days for all employees, or 276 working days per man.

## Sixteen Government Vessels to Be Scrapped

The following letter in regard to scrapping obsolete steel vessels has been sent to scrap firms by David Potter, paymaster general of the Navy:

"The Navy is faced with the problem of disposing of about 16 large steel vessels, including four obsolete battleships of about 12,500 tons displacement each and old monitors and cruisers of lesser displacement. These vessels are located at various yards along the Atlantic Coast. They are probably of no value except for scrap purposes and it is the desire of the Navy to interest companies who would be able to buy these vessels singly, or in groups, with a view to breaking them up for redistribution as scrap.

"Considerable work of this nature has been done by English firms in connection with the disposition of English Navy vessels. In view of the extent of the operation, it is felt that it could be made attractive enough to justify the formation of a company for this particular purpose.

"The Navy will, therefore, appreciate an expression of your views and the possibilities of your company in this connection, and will be glad to furnish any additional information, orally or by letter, on request."

The Purchasing Agents' Association of Connecticut held its annual field day at Naugatuck, Conn., on May 21, as the guest of the Eastern Malleable Iron Co.



## RADIAL DRILLING MACHINE

Unit Design—Diversity of Drive—Centralized Control—Ball Bearing Column Mounting

The Carlton Machine Tool Co., Cincinnati, has recently placed on the market a heavy duty radial drilling machine which incorporates several new features of design.

The machine is designed and built on the unit principle, each component being run off and tested as a unit, before being assembled into the complete machine. Each unit has its own sight or oil level gage. The unit principle permits the use of the following drives: cone pulley with countershaft; tight and loose pulley

vertical shaft transmits the power from the arm knee elevator unit through bevel gears to the horizontal shaft to the head transmission.

The elevating screw is stationary and the arm is raised and lowered by a revolving nut which obtains its power from the arm knee elevator unit. The arm is clamped to the column by two powerful eccentric levers and cannot be raised or lowered until both of these levers have been released, and when the arm is in motion, these levers cannot become engaged. When the arm travels its maximum distance to top of column it is stopped automatically by a plunger disengaging the elevating mechanism, and if the arm or head meets any obstruction while the arm is being lowered, it also stops automatically.

Neither the inner column nor outer column is split and the binding mechanism is located between the inner and outer columns, giving metal to metal contact over its entire binding surface. The column can be locked or unlocked by either hand lever or foot treadle at front of the base from operator's working position. The outer column revolves on ball and roller bearings on the inner column and the arm when mounted can be swung with one pound pressure.

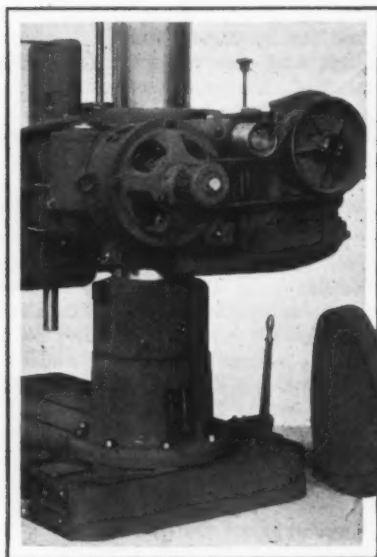
The horizontal shaft delivers the power to the transmission at the rear of head. There are four speed changes in this transmission which together with the six changes in the speed box give twenty-four speeds in geometrical progression covering a range from 18 to 800 r.p.m. to the spindle. All gears in the transmission are made of chrome nickel steel, hardened and mounted on short shafts supported at each end by ball bearings. The transmission case holds 10 gal. of oil and has a pump inside flooding oil to the bearings and gears at all times.

The feed mechanism is also mounted on inside of head and twelve feeds can be obtained by small levers at front of head covering a range of 0.005 to 0.069 in. per revolution of the spindle. The head is made up of sub-units which are entirely inclosed and is balanced so that it may be pushed or pulled full length of the arm by hand.

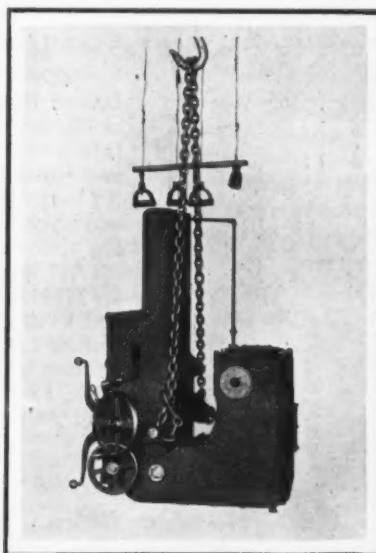
The spindle is low hung drive; driving on the largest diameter of the spindle, close to the work. The spindle is furnished with hardened, renewable female tang. The sleeve for raising and lowering the spindle is mounted at the upper half of the spindle and has teeth cut in. This composes the spindle unit which is balanced by a round weight having rack teeth, with a pinion operating both spindle and weight. The spindle automatically stops at its maximum travel both downward and upward. There is a dial that may be set to stop travel at any desired depth. Head traverse is also built up as a separate unit and may be conveniently removed if necessary.

The base extension is a detachable unit and serves either for mounting a speed gear box or a variable motor. This extension as well as the universal table are furnished as separate equipment; the latter when furnished with round table, being fully universal. The machines are made in 2, 2½, 3, 3½, 4, 5, 6 and 7 ft. sizes.

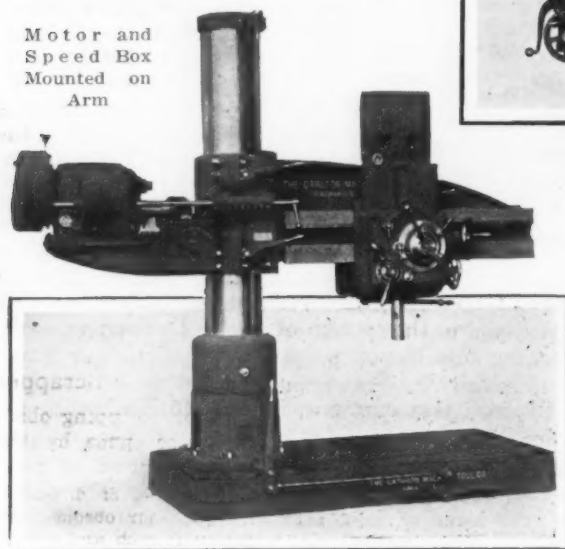
The Bessemer Limestone & Cement Co., Youngstown, Ohio, recently shipped 4400 bbl. of cement from its new plant at Bessemer, Pa., in one day, which represents the heaviest per diem movement to date. The plant is operating to the rated 3000-bbl. daily capacity, with prospects that it may reach 4000 bbl. An official states the company is booked to capacity for four months, with enough additional business in sight to insure operations for the remainder of the year. A price of \$1.80 per bbl. is being maintained.



Head Hung from Crane. Note balance



Motor and Speed Box Mounted on Arm



through speed box; variable speed motor drive direct instead of cone drive, or constant speed motor through speed box. Ordinarily these drives are mounted on the base, but either of the motor drives may also be placed upon the arm, as shown in the accompanying illustrations.

Six changes of speed are obtainable through the speed box while running, the changes being made conveniently by operating the lever to the front of column by hand or foot. The gears are made of chrome nickel steel, hardened and run in oil.

All drives mounted on the base of the machine are connected by a coupling to the stump knee unit which is composed of the bevel gears transmitting the power to the vertical center shaft. This shaft in turn transmits the power through three gears in the cap unit to the outside vertical shaft on the column. This outer

# Business Problems Are Discussed

## Members of American Iron and Steel Institute Give Their Views

Judge Gary Urges Those Who Do Not Agree with Him to Express Their Opinions as to Present Conditions—James A. Campbell, Charles M. Schwab and Willis L. King Respond—Enthusiastic Greeting to General Pershing, Who Describes the Achievements of the Industry During the Great War

THE outstanding features of the nineteenth general meeting of the American Iron and Steel Institute, which was held at the Hotel Commodore, New York, Friday, May 27, were the spirited debates as to business conditions and remedies for the prevailing depression, which took place at the morning session, and the address by General Pershing at the dinner Friday night. The unusually urgent invitation by Judge Gary to leaders of the industry to take part in the informal debate which followed the delivery of his presidential address resulted in a short but pointed discussion, and the members were so pleased by this departure from the usual program that comment expressed in the corridors after the morning meeting indicated a strong desire that this feature be repeated and enlarged at future meetings. Another noteworthy feature was the eloquent speech of Marcel Knecht

of the French High Commission at the banquet, in which he spoke in words of stirring eloquence of the part that America took in the war.

At the banquet, Judge Gary referred to the absence of "Uncle" Joseph G. Butler, Jr., Youngstown, Ohio, who, although saddened by the recent death of Mrs. Butler and confined to his home by illness, had written an optimistic letter to the institute addressed to Willis L. King. Mr. King read the letter, which referred to previous periods of business depression and expressed confidence that the steel industry would emerge from the present period of inactivity and enjoy great prosperity. On motion of Mr. King, a resolution was adopted expressing regret that Mr. Butler was unable to attend and extending the best wishes of all the members of the institute for his early and complete recovery.

### Address of General Pershing at the Banquet

JUDGE ELBERT H. GARY, president of the institute, who presided at the banquet, paid an eloquent tribute to General John J. Pershing, in presenting him to the 1100 guests who attended. "I know of nothing greater in history," said Judge Gary, "than that which was accomplished by this great soldier in the Argonne."

After the prolonged applause which greeted General Pershing had subsided, he began his address by a modest expression of appreciation of the compliments that had been paid him and by speaking with deep feeling of the great leaders of the French people with whom it had been his privilege to co-operate. Then, speaking in a facetious vein, he disclosed that he is not always a grim warrior but has a keen appreciation of humor. He poked a little fun at Charles M. Schwab. "I have," he said, "been exchanging confidences with Mr. Schwab, and I have come to the conclusion that I am not to be the last speaker, for Mr. Schwab said to me that for 15 years the boys had been calling on him to make the last speech at the banquet and he thought they would do so to-night." General Pershing then said:

"It is a very distinct honor and a privilege to be the guest of the Iron and Steel Institute. I am happy to know the representatives of an industry whose activities played such an important part in bringing the war to a successful conclusion. Long before we entered the war, American furnaces and foundries were running at full capacity of production to supply the requirements of the Allies, and when the time came, iron and steel producers all over the country promptly tendered their services to the Government.

"In the face of world conditions as they existed during the three years preceding 1917, and in spite

of urgent appeals by many who realized the difficulties war would involve, no move was made by the Government against the probability of our being drawn into it. We simply sat complacently by and neglected even the most elementary steps and plans of preparation.

"When it suddenly came upon us, tremendous burdens immediately fell upon the country's resources, with no organization by which they could be expeditiously utilized. Manufactured materials of all kinds were lacking, and facilities for their production were undeveloped. Food products were needed and the system of handling them was inadequate. Rail transportation was unorganized for mobilizing men and supplies, while ship tonnage available was well nigh negligible. We had only a small army, with neither policy nor plan for calling out and training the millions of men required for service with the colors.

"So lacking in appreciation of the situation were many of our public men, that while the draft act was under consideration, some argued in favor of a volunteer army. Pacifists spoke dogmatically about an army of a million men springing up overnight. Others confused conscript with convict, none of these realizing that the war would not be won except by the whole people working together. As a matter of principle, the draft act provided the only just method of imposing the obligation of service equally upon all alike, but it did not go far enough. Provision should have been made for mobilizing all industries and all labor that might be useful in the vigorous prosecution of the war.

"I have more than a suspicion that much of the oratory emitted against the draft act was inspired by the slacker class, the lists of which are now being published to the country. It is really not so



surprising, though, that there should be a certain number of slackers, when we consider our lax methods of receiving strangers of unknown origin or character into full citizenship with us, and perhaps still worse, our common neglect in many parts of the country to educate our young men in their duties as citizens. We must give credit to many who meant well but who could not understand.

"But the great soul of America was true and loyal, and it is to the eternal credit of the nation that the elements of disloyalty were engulfed and overwhelmed in the flood of patriotism that swept the country. As for the army, there was never before a more representative body of Americans, none more enthusiastic, none more patriotic, and after training and experience, none more efficient than our splendid army in France.

"While virtually every phase of our industrial and commercial life was eventually drawn upon to defeat the enemy, it was to the iron and steel industry we looked for the vital sinews of war, such as projectiles, guns, ships, tanks, engines, rails, barbed wire, and most worthily did they respond to the call. To the everlasting credit of your industry and to the glory of America, almost a miracle of production was performed with patriotic energy and efficiency that matched those qualities in our fighting men.

"There are many instances that illustrate the unselfish attitude of your various companies, where the entire resources of capital and plant were devoted to problems of producing the specialized material required by the Government. A splendid example was the action of the United States Steel Corporation, which, under the distinguished leadership of Judge Gary, placed country first when war was declared in offering to reduce the prices of its products for the naval program, and later, in undertaking the construction of the Neville Island Gun Plant without profit to itself or recompense for the service of its skilled specialists.

"Small companies cheerfully accepted serious losses in order to supply the Government with the desired material at the minimum prices agreed

upon. The prices suggested in May, 1917, to the War Department by the steel men were so moderate that the War Industries Board felt it necessary in September, 1917, materially to increase them to prevent material loss to producers.

"In building ship yards, in evolving the fabricated ships, and in countless other fields, the iron and steel industry met the pressing demands of a great emergency by placing its power and its skill and capital in co-operation with and in support of the Government. The services of the Institute were of inestimable advantage in co-ordinating the activities of the industry. Without its organization we should have been at a loss for an intelligent workable agency with which to secure co-operation. In a great national crisis, the leaders of your industry proved as ardent patriots as the men who carried through the nation's purpose on the battlefield.

"The President uttered a significant sentence a few days ago when he said 'It must not be again.' Our people deplore war, and there is a very earnest desire throughout the country that there should be some understanding through which the chances of armed conflict may be reduced. But we must realize that a mere wish or desire will not of itself keep us out of war; nor will a careless neglect of preparation prevent it. The desire must be general and the understanding among the nations complete.

"Without some very definite agreement, we must never again be caught so completely unprepared, and we must remember that any large war will again draw upon all our resources. The experience of the past should be preserved for the future. May I suggest that the various leaders and officials in the iron and steel industry record and transmit to generations of officials who will succeed them the knowledge gained by actual experience during war, to the end that we may develop during peace the most efficient methods of mobilizing this industry, and all the industries of the nation in the event of a future military crisis. Your special knowledge, your experience, your influence and your example, will make your active co-operation of the greatest importance in the development of future plans."

## The Morning Session—Judge Gary's Address

THE attendance at the meeting fell below that of last fall, being about 1100 as compared with the record attendance of 1500 made in October, 1920. This was attributed to the prevailing business depression. Although the seriousness of conditions was frankly recognized, a general spirit of hopefulness and good cheer prevailed.

After a few preliminary remarks at the opening session, Judge Gary spoke as follows:

"The devastating and destructive war lasting four and one-quarter years and ending November 11th, 1918, left the entire world in a dilapidated and demoralized condition. Minds had become distracted, visions obscured, morals perverted, natural progress interrupted and the total economic structure disjointed. The destruction of and damage to lives and property were so great and the souls of men so embittered that it was difficult for them to think straight or to act intelligently. In this extremity it seemed desirable, but was found impossible, to promptly establish a basis for the absolute prevention of further international military conflicts. Since the armistice was signed nearly three years have elapsed and nations have been drifting and struggling, endeavoring to formulate and adopt plans for reasonable readjustment and rehabilitation. Up to the present time there still exist doubt, discord and disorder.

"This very brief outline I think will suggest to our minds many facts and circumstances which, combined,

have brought the business situation in the United States to its present state. In a country of 107,000,000 people, requiring for their daily necessities various products aggregating in value billions upon billions of dollars per year, which can be obtained here, having money to supply themselves, production is proceeding much below that which is actually needed for consumption.

### Policy of Economy

"In the richest of all nations, in property and money, with the greatest and most rapidly increasing resources, our people are not buying enough to supply themselves fully with the ordinary comforts of life, although they have the disposition and the means to do so. They are to an appreciable extent wearing their old clothing, living in their unrepaired houses, eating unusually plain food, and in various ways, denying to themselves many of the things they would generally buy and utilize; and they are right in their attitude, up to a certain limit. This is in accordance with the inexorable law of supply and demand. The demand is and for some time has been below normal.

"In the main, what has brought about the present unusually low range of purchases? Why is there less building, diminished purchasing of clothing and wholesome food, less travel and reduction of expenditures for new enterprises and extensions of old?

"It is because the great purchasing public has formed the opinion that there have not been consummated complete and proper readjustments of prices;



and on account of failure to discriminate between different lines or departments of business the whole economic system has suffered.

### The War Policy

"During the time the United States was engaged in the war there was a governmental board in Washington which, by agreement with industry, had general supervision over the selling prices of the larger producers. You are familiar with these proceedings. You were a part of them and you responded promptly and nobly to all the requisitions made by the Government. After costs of production were ascertained by the Federal Trade Commission, patient investigation by the War Industries Board, full opportunity for consultation and discussion, prices were fixed by the Board and you promptly furnished the goods. You voluntarily reduced these prices to a substantial extent almost immediately after the armistice was signed, and three months after repeated this performance. Some have never since increased these prices, and all sooner or later have reduced them. They are now, on the average, at least \$20 per ton lower than the figures agreed upon by the Government Board at its last session. Assuming the steel industry has been fair and reasonable in prices up to the present time, which I need not discuss now, for it is the purchasing public which decides these questions, yet it must be admitted, I think, that there have been and still are charged and collected for certain commodities unreasonable and unfair, if not extortionate, prices. They apply to particular lines and persons. They do not pertain to the majority of lines or individuals. The present offenders, generally speaking, were not subject to limitations by the Government during the war and they have continued and even increased the high prices then obtained. They have done themselves especially a great injury and in doing so have injured others. This applies in varying degrees to sellers of products and also to members of different trades. I am not inclined to deal in personalities. It is necessary only to refer to two or three subjects and to make some illustrations. The public is aware of the facts. Eyes have been opened. Different products have been purchased from the farmer, manufacturer or others at low cost and then passed on in one way or another and finally sold to the consumer at outrageous prices. Retail prices, especially, for many commodities are much too high. Without justification workmen have been classified and reclassified so as to designate them as skilled men. We have heard of persons whose daily wage was advanced from \$3 to \$10 or \$12 at one time under this practice. You know of hundreds of cases illustrating what has been said and it would be useless to further specify.

"The vast majority of business men and workmen are sincere and fair, but there is and perhaps always will be a minority that ignore the principles of common honesty. They are sufficient in number to seriously affect the whole situation. Until these are aroused to the necessity of getting in line with sound and decent standards of conduct, the full return to satisfactory business conditions will be more or less impeded.

### Underlying Principles

"All that I have said during or since the war concerning a return to great prosperity in this country has been predicated on business being managed in accordance with the principles of reason, fairness and honesty.

"However, in considering the question of prices it is to be remembered that many criticisms, favorable or unfavorable, are made which are not justified. The reader or listener should be sure of the truth before reaching a conclusion. The fair-minded man, if he has any facts, will disclose them upon request. Occasionally a writer, through inexperience or lack of knowledge or otherwise, will misrepresent or misinterpret. Every one of us has been subjected to a convincing argument against the validity or soundness of attributed statements which we never made. It is quite common to build a straw-man in order to give evidence of strength in destroying him. But this should never

disturb our equanimity. We must admit we are liable to be wrong when we think we are right.

"Now what, if anything, can be done to improve the general situation? I answer, the first thing for insistence, throughout the world, is the observance and enforcement of law.

"There is no standard for safe and certain progress in economic effort except an established rule of law which fixes and protects the rights of every one without discrimination. There are degrees of virtue and offense; but right is right, and wrong is wrong. Wrong cannot properly be compromised nor fostered; and so long as law is in existence it must govern.

### Business Men Convicted

"Recently we have read of convictions for violations of the criminal law by certain business men. They had controlled selling prices and limited production to the injury of consumers. I am not familiar with the facts and do not know whether or not moral turpitude was charged. The men pleaded guilty and of course deserved punishment.

"And nearly every day for months we have read of strikers violently attacking men who had taken or were offering to fill the places made vacant. Indeed, it seems to be common to attempt by force to prevent operation of producing plants or transportation lines. The freedom of men to work when and where they pleased has been interfered with. Many have been seriously injured and some killed.

"If laws shall be enforced and peace maintained, the other questions relating to economic progress and achievement will be solved. The law of supply and demand will steadily, if gradually, bring about necessary adjustments which are equitable and relative and restore levels which are natural and reasonable. Business will be more or less hesitating until it is generally believed the period of readjustments is over.

"If it should be deemed necessary and wise to have governmental supervision over organized industry in order to protect the public interest, I personally would not object, provided the laws and rules shall apply alike to organized capital and organized labor. Many years ago, at the request of a senatorial committee, I submitted the draft of a bill for consideration that seemed to me then to cover the case, but there was lack of time or disposition to give it immediate attention.

"One of the most hopeful signs of the times is the apparent disposition of the present Administration at Washington to aid rather than obstruct the natural and legitimate progress of business. Any one who intentionally fails to appreciate this desire or neglects to co-operate to the limit of his ability is his own worst enemy.

### What Can Be Done?

"What can be done by the steel industry? Experience has more than once demonstrated that the mere reduction of selling prices does not bring large and satisfactory business. Would-be customers are delaying purchases, except for immediate and imperative uses, until satisfied that a sound and stable basis of prices has been established. There have been reductions and adjustments. Others may be necessary, even in the steel business, before complete restoration of normal conditions. I am not now prepared to express an opinion on this subject. It depends upon circumstances. As to prices and wage rates, producers and employees must be fair and reasonable, taking everything into account; fair toward each other and toward the general public.

"It is well known that at present, unless and until wage rates are further decreased, the costs of many steel producers will not permit lower selling prices. This presents a serious problem. Personally, I think under such conditions wage rates should not be reduced until or about the time selling prices are lowered. I also believe it would be unjust to further reduce wage rates before the costs of living are lower, not of course including the exceptional cases already mentioned where the rates are extortionate, as in many of the trades particularly. So far as practicable, all prices and rates should be adjusted at about the same time so that all interested might be justly and equitably

treated. If a general relative basis has been or can be found then this should be maintained whether it is high or low. All interests must receive the same consideration.

"If we may rely upon the statements by economic and statistical experts, the country is now headed in the right direction, and if this be true, as I believe, then our progress toward recovery, though slow at present, will increase as the days go by. The steel business on the whole is a little better this month than it was last month. General business throughout the

United States has been slowly improving. It is very good in some of the western states. I am not at all discouraged.

"There is an abundance of new business, with both ability and inclination to place it, waiting for further adjustments which will put costs of living, selling prices, wage rates and other general incomes on a relative parity. As usual, many will wait too long. There is nothing the matter with the country; it is with individuals. Patience, courage and a fair disposition will bring satisfactory conditions in due time."

## Short Talks By Leaders of the Industry

AT the conclusion of his address Judge Gary suggested that it would be well to have a number of short speeches from leaders of the industry upon present business conditions. He said that he especially desired those who might disagree with him to express their opinions. After a short period of waiting, Judge Gary recognized Willis L. King, vice-president Jones & Laughlin Steel Co., Pittsburgh, who briefly discussed business conditions, comparing them with the panic of 1893, which he said was much worse than the present period of depression, the principal difference being the great lack of capital in 1893. He said that labor is the largest item that must be readjusted, and he also referred to the high freight rates now prevailing. He expressed confidence that in due time the steel business would be prosperous and that the institute would have increasing influence upon the affairs of the country and the world.

Nobody seemed to be ready to talk after Mr. King sat down, and Judge Gary remarked: "If Uncle Joe Butler were here, he would speak." Then in response to calls, Mr. Schwab responded, first in a lighter vein and then in seriousness, urging the importance of economy. He said that the keynote of return to prosperity is economy in every direction, and he believed that if the steel industry profits by the experiences that it is now having, the depression of this year will have a beneficial effect. Mr. Schwab said that to the higher cost of transportation is due chiefly the increase in the cost of steel and that freight rates must be reduced.

### The Price of Rails

James A. Campbell, president Youngstown Sheet & Tube Co., said he was disappointed in the preceding speeches, except Mr. Schwab's, not making any definite suggestion as to remedies for the present depression. He said that he agreed with Mr. Schwab that the transportation problem is one of the most important before the country to-day. He

referred to \$47 as too high a price for rails and said the railroads could not reduce freight rates until their costs are reduced. He said they could not prosper with the Interstate Commerce Commission determining rates and the railroad labor board determining wages. He believed in supervision by the Interstate Commerce Commission, but advocated the repeal of the Adamson law and the modification of the Esch-Cummins law. He spoke a word for the farmers, saying that prices of steel are relatively higher to-day than those of farm products. Mr. Campbell was heartily applauded.

Judge Gary said that he had tried to suggest ways of improving present conditions, particularly as to transportation. He held no brief for the railroads and realized that the prices of things which they have to buy must be decreased. He said he did not complain so much of the rate of wages paid as of the little work done by many employees. He also thought that the classification of employees needed to be corrected. Turning to the rail question, Judge Gary said: "I do not mean to throw stones, but it is true that Mr. Campbell is not manufacturing rails, and in my opinion some of the products which he manufactures are, in proportion to costs, more out of line than is the price of rails."

Mr. Campbell, replying to Judge Gary, said that the judge had misunderstood him. He had no quarrel with the Railroad Labor Board, but he believed that too much was being paid for it and he thought there should be more unity of control by the railroads. He said that if his business were controlled by boards and commissions as is that of the railroads, he would go to farming, although farming business is also in bad condition. He had not meant to say that rails is the only product on which prices are too high.

As the discussion became pointed, Mr. Schwab told a story which made everybody laugh, and the next part of the program, the reading of papers, was started.

## Addresses of Marcel Knecht and Others

AFTER words of welcome from President Gary at the banquet Friday evening, Lewis Nixon was introduced as one who had had long experience in shipbuilding and public affairs, and he spoke particularly of the present situation in regard to merchant marine. He said it was a matter of general congratulation that Mr. Farrell had decided not to become president of the shipping board, because to do so would be to undertake a hopeless task. He said the Government should not attempt to manage ships. He advocated the repeal of the LaFollette law, which he denounced as a most pernicious measure. He favored the remittance of tolls both on coastwise trade and foreign trade and the abolition of all regulations which prevent American ships from competing with those of other lands.

Charles P. Perin, consulting engineer, New York, who recently returned from a trip to India, spoke of the wonderful resources of that country, including 20,000,000 tons of high grade iron ore. He said that economic conditions are very bad in India. At Calcutta large quantities of American products have been stored, including automobiles. He said that on account of the uncertainty as to delivery, buyers had been in the habit of ordering many more than they expected to need. If, for instance, they wanted two automobiles, they would order 16 and would probably get two, but when business conditions changed, American automobile manufacturers started to deliver with great promptness, and the man who wanted two automobiles would receive 16, for which he was unable to pay.

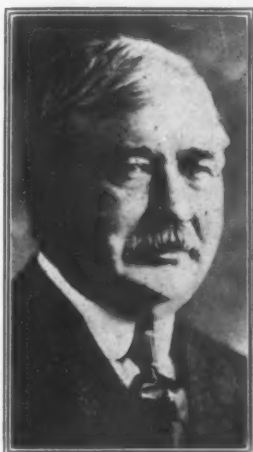


Marcel Knecht, well known to many members of the Institute on account of his connection with the French High Commission and an address which he delivered to the Institute during the war, spoke with deep feeling and rare eloquence of the part that America had taken in the war, praising particularly the services of General Pershing and Judge Gary. He said that while America had come into the war partly in its own defense, it also went in to fight to help France and save civilization. "France," he said, "will always stand by America. We love America and we know America will always be right. If at any time in the future you should need the help of France, we will come. New La-

fayettes will rise to lead us and then we will say to General Pershing: 'General Pershing, here we are.'" This paraphrase of General Pershing's historic words, "Lafayette, we are here," was greeted with enthusiastic applause.

Mr. Schwab, of course, made the final speech of the evening, telling some really new stories, and ended with an earnest appeal to the young men of the iron industry to seek to achieve, as the men now passing from the stage of action have done. He said the young men must guide the ship of steel industry through the troubled waters of the future, and he did not have a particle of doubt that they would do it.

## Authors of Papers Read at Institute Meeting



ELWOOD HAYNES



H. D. SAVAGE



WESLEY J. BECK



ARTHUR H. HUNTER



CHAS R. STURDEVANT



WALTER N. FLANAGAN



E. O'TOOLE

**ELWOOD HAYNES**, author of the paper on stainless steel, showed his bent for experimentation as a boy when he built a furnace where he melted brass, iron and other metals. This same interest in chemistry inspired him to invent stellite in 1911, an untarnishable alloy of cobalt and chromium, which may be used for machine tools when hardened by the addition of tungsten. Work on stellite led to experiments with chrome steel and to the discovery of stainless steel. Mr. Haynes was born in Portland, Ind., Oct. 14, 1857. He was graduated from Worcester Polytechnic Institute in 1881, taught school at Portland for four years, then attended Johns Hopkins University the winter of 1884-5. He became manager of the Portland Gas Co.; in 1890 became field superintendent of the Indiana Natural Gas & Oil Co., two years later becoming superintendent. He built the first successful gasoline automom-

bile in America which made its first run July 4, 1894; he organized the Haynes-Apperson Automobile Co., later becoming president of the Haynes Automobile Co.

H. D. Savage, in charge of the pulverized fuel division, Combustion Engineering Corporation, who read a paper on the use of powdered fuel under steam boilers, was born in Memphis, Tenn., in 1880, but soon moved to Ashland, Ky., where he attended school and later the Kenyon Military Academy. He started in the combustion field in 1897 with the Ashland Fire Brick Co., remaining until 1914. With the late E. S. Hitchins he organized the Refractories Manufacturers Association and was its first president. A year later he was elected vice-president of the American Arch Co. Later he was made vice-president of the Pulverized Fuel Equipment Co., retaining his office with the Arch company. Last year he arranged a combination for



the Pulverized Fuel Equipment Corporation whereby it became a part of the Combustion Engineering Corporation. He is a member of the American Society of Mechanical Engineers and of the American Institute of Mining and Metallurgical Engineers.

Wesley J. Beck, director of research American Rolling Mill Co., Middletown, Ohio, in charge of the chemical, metallurgical and electrical laboratories, is a product of Purdue University, whence he was graduated as electrical engineer in 1896. His subject before the Institute was "The Development of a Commercially Pure Iron in the Open-Hearth Furnace." He is a native Hoosier, having been born July 28, 1875, at Lafayette. From 1897 to 1903 he was employed by the Westinghouse Electric & Mfg. Co., East Pittsburgh plant, in the testing and engineering department, specializing in steel for electrical purposes. He has been with the American Rolling Mill Co. since July, 1903, having occupied his present position since October, 1910.

Arthur H. Hunter, organizer of and president Atlas Crucible Steel Co., Dunkirk, N. Y., who treated molybdenum in his paper, was born in Colchester, Delaware County, N. Y., April 25, 1874. He was educated in the public schools of Downsville, Ransomville and Buffalo, N. Y., and Sioux Falls, S. D. In 1905 he left Government service to engage in the manufacture of cast iron radiators and boilers with the Buffalo Radiator Co. as manager of sales and engineering, serving five years. He resigned to spend the next two years in experimental work, a part of which was carried on at the South works, Illinois Steel Co., and some with Joseph T. Ryerson & Sons, Chicago. In 1912 he organized the Atlas Crucible Steel Co., maker of high grade alloy and carbon steels by the crucible, electric furnace and open-hearth processes.

Charles R. Sturdevant, educational director American Steel & Wire Co., Cleveland, who discussed educational work in the wire industry, had a career parallel to Mr. Haynes in this respect—he taught school for the same period, four years, which teaching experience he has used to good advantage in his present position. He has been with the steel and wire company since 1905, the last nine years of which period he has developed various courses in industrial education. His first seven years with the company were devoted to special engineering work in producing electrical products. He was graduated from Cornell University in 1892, specializing in mechanical and electrical engineering. He taught the latter subject in one of the Southern col-

leges, having developed his own course. In the year 1901-1902 he was with the E. P. Roberts Co., Cleveland, consulting engineer. For the next two and a half years he did special engineering work for the Ohio Brass Co., Mansfield, Ohio.

Walter N. Flanagan, whose subject was "Recent Developments in Steel Works Power Plants," naturally drifted into the steel business, having been born and educated at Pittsburgh. He was an honor graduate of the Carnegie Institute of Technology in mechanical engineering. Then he gained three or four years experience in various shops, drafting rooms and steel works. He was a graduate assistant in mechanical engineering at the Carnegie Institute of Technology in 1915; for one year he was assistant to Professor Trinks on consulting work. In 1917 he joined the steam engineering department of the Jones & Laughlin Steel Co. From 1918 to the present he has been with the Ohio works of the Carnegie Steel Co., starting as assistant steam engineer, later becoming engineer. He is an associate member of the American Society of Mechanical Engineers, the Association of Iron and Steel Electrical Engineers and the Engineers' Club of Youngstown, Ohio.

E. O'Toole, to whom was assigned the subject, "Dry Cleaning of Coal by Means of Tables," has gained his knowledge of mining through work underground in the states of Ohio, Pennsylvania, Montana, Washington and Colorado. He was born in Salineville, Ohio, Dec. 27, 1866, and was educated in the public schools of that place. In 1892 he joined the H. C. Frick Coke Co. as fire boss, becoming mine foreman later, then superintendent. Upon the formation of the United States Steel Corporation he was made division superintendent in charge of the American Coke Co., Eureka Fuel Co., and Continental Coke Co. then under construction. In the fall of 1903 jurisdiction extended to all of the mines of the Frick coke company. Now he is general superintendent of the United States Coal & Coke Co. properties in McDowell, Mingo, Wyoming and Barbour counties, West Virginia, and Harlan and Letcher counties, Kentucky, planning and directing the construction of mining towns and development of mines. He has visited and directed examinations of coal properties for the Steel Corporation in the United States, Germany, Belgium, France and England. He is a member of the American Institute of Mining Engineers, American Mining Congress and the Coal Mining Institute of America.

## Educational Work in the Wire Industry

Courses on Salesmanship, Americanization and for Foremen  
— Vestibule Schools and Trades Course — Some Results

— BY CHARLES R. STURDEVANT\* —

FOR a number of years industries have been giving much attention to the health and general physical well-being of their employees through their accident prevention drives, athletic activities, sanitary precautions, hospitals, and pension systems. It is only within recent years that steel makers have come to realize fully the need of encouraging and assisting their employees to improve their mental powers.

### Educational Courses

At present our company is conducting the following distinct educational courses: An intensive course for our salesmen, a special business English course for our general office forces, Americanization courses for our non-English speaking employees, vestibule schools for skilled and unskilled workers, a trades course for up-grading our craftsmen, a special apprentice course for a limited number of our technically trained men, and a course for our foremen and super-

visors. The Americanization, vestibule and trades courses are elementary in nature; the courses for salesmen and foremen are intermediate; the student apprentice course is advanced, while the business English is a special course and the business library is used as an accessory.

These courses are intended for men of our organization who have made creditable service records rather than for new men. Admittance to any of the courses is voluntary on the part of the employee, which automatically brings to light the ambitious and the capable. No one is required to sign indentures or agreements to remain with the company after completing any course.

### The Salesman's Course

Our educational work was begun in 1912 with a short intensive course for salesmen. To date 496 men have taken this sales course and a few of the earlier men are now reviewing it. Salesmen from different sections of the country, together with a small number

\*Educational director American Steel & Wire Co., Cleveland.

of supervisors from other departments, devote all of their time during six consecutive weeks to making an intensive study of materials and processes and to familiarizing themselves with all the products we manufacture. About half of each day's work during the six weeks is devoted to mill inspection under competent guides, while the remainder of the time is divided equally between recitation work, free discussions and study. No attempt is made to teach the principles of salesmanship to experienced salesmen. By means of a special correspondence course we teach them business English and keep those who finish the sales course in close touch with all new matters pertaining to our business, and with the most essential industrial literature of the day.

#### Americanization

Last year there was employed in our mills and works offices a total of over 20,000 foreign born who spoke 82 different languages and dialects. During the past few years, along with many of the other large industries, we have been holding a number of Americanization classes for teaching the alien how to speak, read and write the English language, and for encouraging and assisting him to become an American citizen. We recently had 1600 immigrants in these classes meeting twice a week on company time under the supervision of some eighty different instructors. The direct objective or Roberts system, or a modification of this, is used in teaching these classes. By this system the student soon learns to express himself regarding the common things with which he associates in his daily life. The lessons in this course naturally prepare the more intelligent students for other and more advanced courses along technical lines. Up to the present time 600 have completed this course and have acquired a good working knowledge of our language.

We are not only doing ourselves a good turn in Americanizing our alien labor, but we are doing a great good for the men, and also for our government in helping to make better Americans. A large percentage of the men attending these classes have taken out their naturalization papers.

#### Musical Organizations

Although music can hardly be classed as purely educational, it is known as a universal language and has educational value as well as being cultural and elevating. We have been offering our musically inclined employees much help and encouragement through the development of several different musical organizations. There are now at our various works about 25 brass bands and a number of orchestras, glee clubs, quartets and so on, each being developed under capable leadership. Approximately 1000 men are interested in these various lines and many of the groups are rendering exceptionally good music.

#### Vestibule Schools

There are three groups of men directly concerned in the production of steel, the skilled and unskilled workers who fashion the material passing through the mills, the mechanics who keep the wheels turning, and the foremen and supervisors who are the top-sergeants in manufacturing industry. Our aim is eventually to aid the first and largest group in vestibule schools, which will be placed under the supervision of foremen or works superintendents. The time to help the worker and to place him to best advantage is by giving specific job instruction at the time he enters the works, and the vestibule school, which was developed to such a high state of efficiency during the war, is especially suited for this purpose. In such a school a young or inexperienced man may in a few days or weeks be taught to effectively operate a fairly intricate machine and at the same time be taught all essential shop rules and company policies. We have only made a beginning with this kind of instruction.

Since these three groups of men—the workers, the mechanics and the foremen—control and direct all operations, all machinery and tools and all motive power, any effort to increase the ability and utility of these men should justly be considered as production work of the highest order.

The trades course covers those fundamentals in shop arithmetic, in the elements of applied science, free hand pencil drawing and highly specialized trade knowledge, which the electrician, the machinist and the pipe fitter and carpenter should know and which all ambitious men are anxious to learn.

It may be questioned why these men did not receive this academic knowledge at the public schools, or why they do not now attend night schools. In answer to the first question, according to an accepted authority 10 per cent of the children in this country leave school before they are 13 years of age, that 40 per cent leave before they are 14; that 70 per cent have left by the time they are 15, and that 85 per cent have left by the time they are 16 years old. Only a small percentage ever enter high school and less than 25 per cent of those who enter finish the high school course. On the average, schools carry their pupils only as far as the fifth grade or not as far as that in some cities.

In cities and large manufacturing centers most of our working force is recruited from this great body of men who have left school at these early ages, and from a larger number of illiterates. Only an extremely small number of these poorly educated men will attend the public schools after reaching adult life, partly on account of pride, and partly for want of initiative or courage to make the start. A few are reached by correspondence schools or Y. M. C. A. classes, but these must of necessity be quite general in nature. But when their own company extends them a helping hand in the right spirit, the opportunity is eagerly grasped by all those who are ambitious and capable and who have long recognized the great handicap under which they have been working.

#### Foreman's Course

Three years ago we started our first foreman's class and to-day we have enrolled about 400 prospective foremen and supervisors. Ten men, recommended by mill superintendents or managers, make up each class, and they meet with an instructor twice a week in suitable class rooms which are arranged in or near the mills where the men are employed. The class men go directly from their work to the recitations at convenient periods during the working day. The complete course consisting of 175 lessons requires the greater portion of two and a half years, though a few of the classes have been able to shorten this time by doubling up the lessons.

The scope of the lessons comprising this course covers practically all the activities of a foreman in steel and wire mills. It is a special upgrading educational course, but does not go extensively into the details. The foreman's chief function is quantity and quality production within cost and schedule limits; therefore, he should know much about materials and processes and he should have good business traits. The bulk of the lessons is devoted to the technique of the steel and wire business. The foreman is required to maintain efficiency, discipline, stability and morale among his workmen, and to work harmoniously with other foremen and with his administrative superiors; therefore, he must be a good manager of men and a student of human nature. There are over 20 lessons on the subject of management. He is responsible for the general welfare of those over whom he presides; therefore, he should be a student of all those welfare activities now common to industries. There are suitable lessons covering this subject. Finally, he is placed in charge of a valuable plant and he should be acquainted in a general way with the general engineering features involved in the equipment and operation of his plant. This subject is covered in some 20 lessons.

#### An Engraved Diploma Given Each Graduate

At the close of the course each student is given an engraved diploma and he is graded in accordance with his educational record, his service record and his observed prominent characteristics. Special ratings are made independently by his instructor and his superintendent along the lines so effectively developed during the late war by the psychological staff of the surgeon general's office for the selection and advancement of all army officers. This rating scale system we find is



also bringing about quite a favorable reaction upon all those who have to make them out.

In the development of such a course we have found that success or failure depends largely upon the qualifications of the instructor. To be successful he must have a well-trained mind, one that is well fortified with a broad and general knowledge, and he must also have a pleasing personality.

#### Some Results

Though our foreman's classes have been in operation only three years this period has been sufficient to disclose a few definite beneficial results both to the men and the company. One of the greatest benefits comes from the fact that it imparts to our men many new and useful ideas which they are applying in their daily work.

The men have already applied their knowledge to the betterment of working conditions, such as making improvements in machines, tools and in processes, improving fuel consumption, handling men and so on. One of our general foremen only a few weeks ago said that, while studying one of the lessons, he received a

new idea which set him to thinking about a certain process in his department and that, as a direct result of this new idea, he instituted a series of experiments which now gives good promise of completely revolutionizing this particular process.

A man feels that he belongs to the company when he begins to use the opportunities offered by it for self development. While it is not always possible to change his position, it is possible to greatly change his attitude through instruction. The course makes for better reasoning powers and more accurate judgments. It has greatly stimulated the thinking and creative ability of the men and quickened their imagination. It organizes and vitalizes the working knowledge previously possessed by each student employee, and it supplements it with fundamental academic and scientific knowledge. It has discovered and developed much latent talent in the organization. After all, the ultimate object of all legitimate industry is or should be the betterment of society, and the most direct way for any industry to approach this problem is to begin with the personnel of its own organization, along lines that are reasonably conservative.

## Pure Iron From Basic Open-Hearth Furnaces\*

The First Heat Made—Degasification and High Temperature—Rolling at the Critical Ranges—Degree of Purity

BY W. J. BECK

**I**NGOT iron made in an open-hearth furnace differs from the older irons in having a typical crystalline structure, a more definite critical temperature range, and more particularly in being essentially free from slag.

#### The First Heat

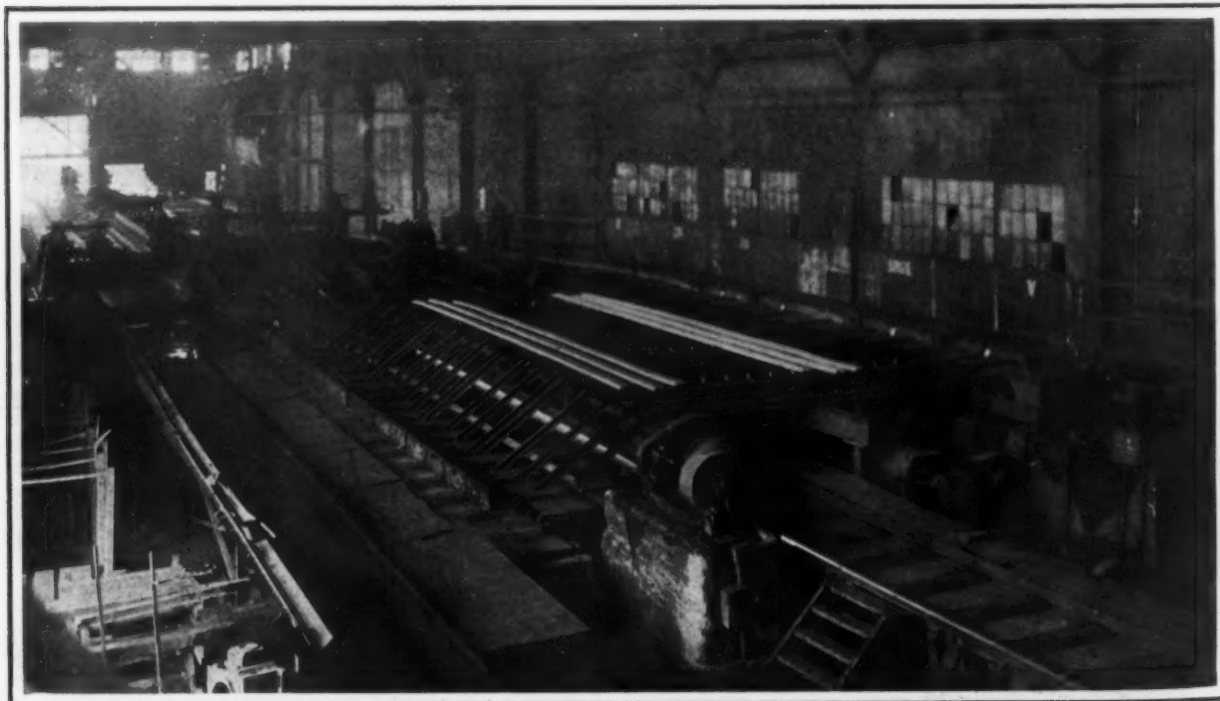
In the first heat an attempt was made to produce a metal containing not over 0.05 per cent manganese. It was done at the risk of losing the heat and the ladle. Care was used in the selection of the raw materials so that the melt would be as low as possible in carbon and manganese. The heat was charged in a 35-ton furnace and the bath of metal melted low in carbon, as it was believed that the lower the carbon could be

driven the lower would be the manganese. Regular open-hearth practice was followed with the exception that an additional quantity of iron ore was added to assist in the removal of the carbon and manganese. In addition to this an excess amount of lime was charged for the purpose of eliminating as much sulphur and phosphorus as possible.

These early experiments in the open-hearth furnace were made with producer gas as fuel. This was high in sulphur which contaminated the metal. In order to eliminate as far as possible the impurities in these heats it was found necessary to hold the metal in the furnace longer than is required in ordinary steel practice, in some cases as much as 50 per cent longer than the ordinary steel heat, with danger to the operators and to the furnace.

On tapping the first iron heat into the ladle it was wild. The normal amount of aluminum customary in

\*The first part of this paper deals with the history or the effort to produce very low carbon-manganese metal in open-hearth furnaces. The author is director of research American Rolling Mill Co., Middletown, Ohio.



The Cooling Bed Where the Bars Are Allowed to Fall Below the Critical Temperature Before Rolling into Sheets



making steel heats had been used, but in later developments it was found necessary to increase materially the amount of aluminum, to insure proper deoxidation and degasification.

The analysis of this first heat of ingot iron was: Si, trace; S, 0.028, P, 0.003; C, 0.03 and Mn, 0.04 per cent. At that time it was customary to analyze only for these five elements, the aggregate of these being subtracted from 100, which was the basis then used, indicated the iron content by difference.

#### Degasification and High Temperatures

In the manufacture of such pure metal the process of degasification was not understood. It naturally followed that a large number of sheets were produced which contained imprisoned gases. When such sheets were galvanized the expansion of the gases caused the formation of blisters up to 12 in. in diameter, giving a product which could not be sold even as wasters, and of doubtful value as scrap. This trouble resulted in a further search for a method to eliminate the gases which were responsible for the blisters. Green saplings were used by plunging them down into the bath of metal in the open-hearth furnace after the heat was melted, in an effort to agitate the metal to help remove the impurities. This slightly reduced the time of finishing the heat, but nothing could be found to substitute for the extremely high temperatures necessary to reach the desired analysis of the metal.

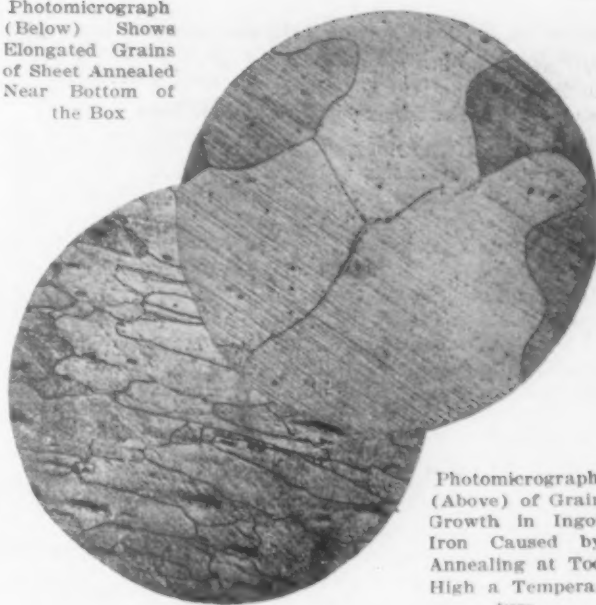
These destructive temperatures shortened the life of the furnaces and very greatly increased the cost of the metal. In fact, it was impossible to make this metal continuously in the furnace because of the cutting action on the linings, due to the high iron oxide in the slag. To meet this condition heats of pure iron were alternated with regular steel heats.

The experimental heats of iron produced many unusual and unlooked-for results. One of these contained so much gas that nothing but piped ingots were made. In fact, some ingots were piped from end to end with only a thin wall. These had the shape of the molds and weighed but a few pounds, whereas they should have weighed approximately 900 lb.

Special efforts to secure iron of extreme purity were continued in the open-hearth department during 1906 and 1907. Every effort was made to produce a material of high purity. All practical suggestions (and many that were apparently impracticable) were tried. The principal difficulties, however, remained; that of the control of high temperatures necessary in producing this iron and the proper degasification of the metal.

As the experimental work progressed it was found that there were considerable differences in the practice of producing commercially pure iron as compared to steel practice, which materially added to the cost. In the first place, it required several hours longer to make

Photomicrograph (Below) Shows Elongated Grains of Sheet Annealed Near Bottom of the Box



Photomicrograph (Above) of Grain Growth in Ingot Iron Caused by Annealing at Too High a Temperature

an iron heat than a steel heat, and the final temperature of the metal was 200 deg. Fahr. higher than a heat of steel. Another marked difference was also found between the percentage yield of metal, as compared with that when steel was made. It was several per cent lower in the iron heats because the high temperatures and longer time employed in the manufacture of iron oxidized more of the iron, which was lost in the slag. The iron oxide in this slag is several times greater than the iron oxide in the steel slag. Some of this, however, is derived from the iron ore used in oxidizing the carbon and manganese.

In order to emphasize the importance of the selection of raw materials in the manufacture of commercially pure iron, there are certain elements which, if they exist in the raw material, are not eliminated in the open-hearth furnace. Among these are copper, arsenic, antimony, tin, nickel and cobalt.

#### The Critical Temperature Range

Early ingots were frequently split with a metal saw so that the interior structure and the degree of degasification could be studied. It was found that ingots degasified with a slight excess of either silicon, aluminum or even with the use of a small amount of ferromanganese, may be perfectly sound as far as gas pockets determine this factor. Nevertheless, such material will go to pieces when an attempt is made to roll it.

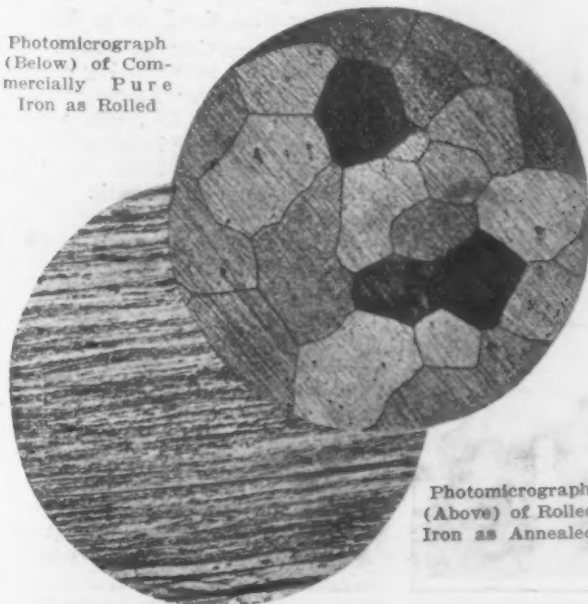
This breaking up of material degasified with an excess of degasifying agents led to the discovery that pure iron had to be worked within a certain range of temperature; otherwise, it was found to be red-short and could not be rolled. It was also found that not only was the rolling of commercially pure iron affected by the presence of impurities from the degasifying agents, but it was materially affected by the presence of sulphur. The higher the sulphur content the more difficult it is to roll this iron at any working temperature.

Being almost pure, this iron has, like many commercially pure metals, a critical range at which temperature it cannot be worked. This temperature is about 900 deg. C., but for working conditions it is impracticable to roll at temperatures between 800 and 1000 deg. C. In the commercial manufacture of this iron it is necessary to roll the material above the critical range on the blooming mill and below the critical range on the bar mill, which necessitates cooling tables between the two mills, which are unnecessary in steel practice.

This delays mill production and adds materially to the cost of iron. One illustration shows the large number of bars which are accumulated before the first bar has cooled sufficiently to make it possible to roll below the critical temperature.

Because of the tendency of the sheets to weld to-

Photomicrograph (Below) of Commercially Pure Iron as Rolled



Photomicrograph (Above) of Rolled Iron as Annealed

gether at the higher temperatures, the sheet bars also must be rolled on the sheet mills at much lower temperatures than employed in rolling steel sheet bars.

#### Photomicrographs of Ingot Iron

The use of the microscope plays an important part in the final treatment of these pure iron sheets, and special care is necessary in the annealing. Photomicrographs of a sheet as rolled on the sheet mill show, first the elongated grains and then after proper annealing the rounded grain structure. The photomicrographs also illustrate clearly the effect of improper annealing upon the structure of the metal. The elongated grains of a sheet annealed near the bottom of the box are due to either insufficient time or to low temperature. The coarse grains, free from strains, illustrate the

grain growth caused by annealing at too high a temperature.

#### Purity as Shown by Analysis

The high purity of the metal finally attained is shown by the following average analysis: Si., trace; S., 0.035; P., 0.005; C., 0.013, and Mn., 0.021 per cent. The average analysis compiled from records covering a period of 12 months gives this iron a purity of 99.865 per cent. This takes into consideration the nine impurities—silicon, sulphur, phosphorus, carbon, manganese, copper, oxygen, hydrogen and nitrogen.

In addition to almost 200,000 tons of ingots produced in this country during the past year, pure iron made in the open-hearth furnace is being produced abroad and used extensively in Norway and Sweden.

## Use of Powdered Fuel Under Steam Boilers

Commercial Installations in Power Plants—Operating Results—Tests and Comparative Costs—Slagging Problems

—BY HARLOW D. SAVAGE\*

THE primary object of this paper is to present a digest of the work that has been done in the last three years in the equipping of steam power plants with powdered coal, to record the progress that has been made in making powdered coal for steam production thoroughly reliable and efficient and to present the economic possibilities of this method of combustion.

#### Powdered Coal Installation

The first commercial installation of any considerable size was at the Oneida Street plant of the Milwaukee Electric Railway & Light Co., Milwaukee, where five Edge Moor boilers, each of 468 nominal h.p. capacity, were equipped in 1918. This plant, which is a combined heating and power plant, the principal load being the heating load, has been in operation for nearly three years. At the plant of the Allegheny Steel Co. at Brackenridge, Pa., there are equipped nine 333 h.p. Wickes boilers and two 600 h.p. Stirling boilers. The boilers have been in operation for about two and one-half years, and have met in a satisfactory manner all the requirements of the widely fluctuating load, which is characteristic of steel plant operation, with large fuel and labor savings. Additional boilers are now being equipped at this plant. An unusual

feature of this installation is the fact that no dryers are installed in connection with it. The company mines its own coal adjacent to the plant and the coal contains less than 1 per cent moisture as it comes from the mine. The pulverizing plant in this installation is approximately 350 feet from the boiler room, and although the screw conveyor used to transport the coal is exposed to the elements, no difficulties have been met with either in conveying or firing, due to lack of dryers.

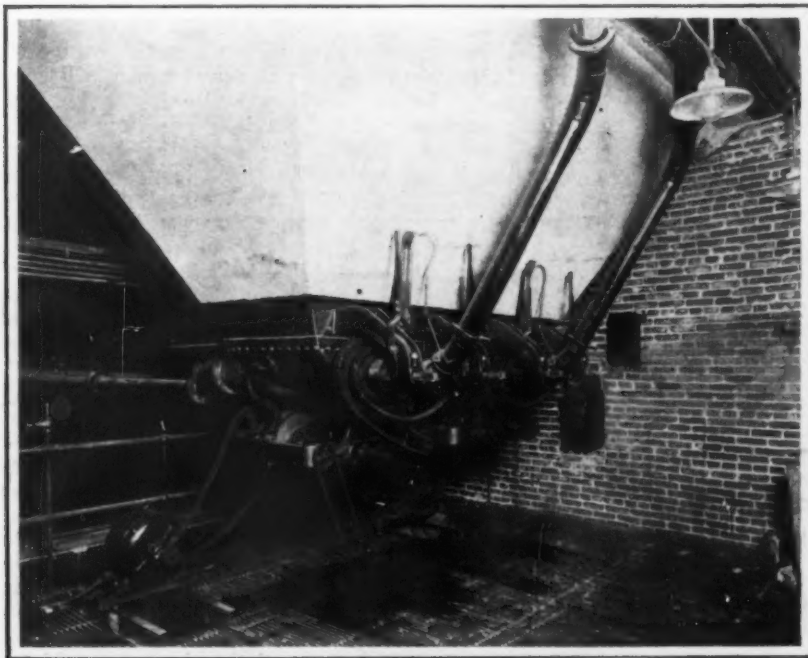
At the Lima Locomotive Works, Lima, there are equipped six 400 h.p. Wickes boilers, one 500 h.p. Heine boiler and one 500 h.p. waste heat Wickes boiler. At the Oklahoma City plant of Morris & Co., the meat packers, there are five 500 h.p. Edge Moor boilers and two 300 h.p. Edge Moor boilers. A distinguishing feature is the ability to operate the plant on either natural gas, fuel oil, or powdered coal—whichever the condition of the market warrants as being most economical.

At the plant of the St. Joseph Lead Co., Rivermines, Mo., two Stirling boilers of 768 h.p. each were installed. These boilers have been in operation for about three months. They are being operated at from 200 to 225 per cent of rating, with flue gas temperatures of 580° to 609° F. In December the first of eight 1308 h.p. Edge Moor boilers was started at the new Lake-

side plant of the Milwaukee Electric Railway & Light Co. There are eight boilers in the plant, two equipped with the Fuller System and six with the Lopulco System.

An interesting powdered coal application is now nearing completion at the River Rouge plant of the Ford Motor Co., where powdered coal is being installed in connection with four Ladd boilers of 2640 nominal h.p. each. These Ladd boilers are the largest boilers that have as yet been built and are intended to operate normally at from 200 to 250 per cent of rated capacity. The boilers will operate on a combination of blast furnace gas and powdered coal, and the design is such that these fuels can be used either separately or in combination.

After a careful study of the combustion characteristics of the various types of fuels under consideration, it appeared that the conditions governing the efficient combustion of both blast furnace gas and powdered coal were so



Feeders at St. Joseph Lead Co. Plant

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similar as to make this the only feasible combination. The furnace requirements for the efficient combustion of blast furnace gas seemed to approximate very nearly the furnace requirements for the efficient combustion of powdered coal. In this installation the gas is introduced horizontally at a lower level than the coal and through the medium of an especially designed grid burner.

At the plant of the Bethlehem Steel Co., Lebanon, Pa., there are four 520-hp. Babcock & Wilcox boilers that have been in operation approximately one year. These boilers are operated at around 175 per cent. The British Columbia Sugar Refining Co., Vancouver, has two 504-hp. Badenhausen boilers, two 250-hp. Babcock & Wilcox, nine 110-hp. horizontal return tubular and two 500-hp. Stirling boilers. It is understood these are being operated at around 150 per cent of rating. The Puget Sound Traction Co., Seattle, has ten Babcock & Wilcox boilers from 300 to 600 hp. They have been in operation about two years.

#### Operating Results

The plants above described are, we believe, the only plants of any considerable size that are in actual commercial operation, and, situated as they are, in widely varying geographical locations, naturally operate on a very wide range of fuels. The Allegheny Steel Co. uses a fair grade of Pittsburgh coal. Steam-flow meter indications would tend to show that these Wickes boilers are operating at around 250 per cent rating when the steam demand necessitates. As previously stated, there have been no unusual difficulties from the burning, preparing or transporting by screw conveyors of the undried coal.

The Milwaukee Electric Railway & Light Co. operates on either Illinois and Indiana screenings or Youghiogheny coal. Tests showing a combined efficiency as high as 85.22 per cent have been made by this company.

At the Lima Locomotive Works bituminous coal from the Central Ohio district is used, analyzing approximately as follows: Moisture, 3.0 per cent; volatile, 32.20 per cent; fixed carbon, 50.60 per cent; ash, 17.20 per cent; sulphur, 1.94 per cent; B.T.U., 11,935. Very satisfactory results have been shown, and data taken have indicated efficiencies well over 80 per cent. This analysis is on the dry basis.

At the plant of Morris & Co., the fuel generally used is from the McAlester district, analyzing about as follows: Moisture, 5.20 per cent; volatile, 33.39 per cent; fixed carbon, 48.34 per cent; ash, 13.07 per cent; sulphur, 0.63 per cent; B.T.U., 12,417. Observed periods have shown efficiencies of from 78 to 84 per cent. Recently a test was conducted at this plant on several carloads of lignite from the Hoyt district in Texas. Six separate tests were run and the combined efficiencies were from 68.48 to 78.15 per cent.

A thousand tons of anthracite culm from the Wilkes-Barre district was recently burned for purposes of demonstration at the plant of the Lima Locomotive Works. The culm, as fired, analyzed as follows: Moisture, 1.32 per cent; fixed carbon, 64.9 per cent; volatile, 8.35 per cent; ash, 25.43 per cent; sulphur, 0.87 per cent; B.T.U., 11,227. The entire plant was run for the period of a week on this culm, which was put through the bituminous coal plant in the usual manner without change of any kind in either the pulverizing or firing equipment.

A small quantity of Rhode Island graphitic anthracite was also burned several years ago with good combustion results. Coke breeze has been burned successfully, but the cost of preparing both coke breeze and anthracite under present conditions is such as to make this method of doubtful value, when compared with such equipment as the Coxe

stoker, which handles all but the extremely fine sizes without preparation and with most favorable combustion results.

#### Bureau of Mines Tests

A series of tests and investigations at the Oneida Street plant of the Milwaukee Electric Railway & Light Co., covering a period of some 10 months, were made by the Fuel Section of the United States Bureau of Mines in co-operation with the Research Department of the Combustion Engineering Corporation. [The result of these tests was described on page 1041, in the May 26, 1921, issue of THE IRON AGE.]

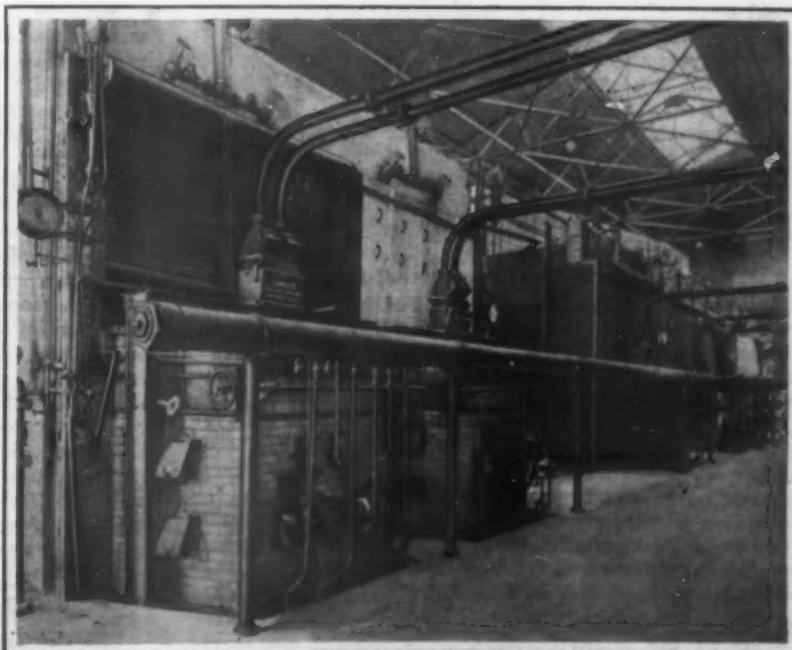
#### Firing Direct from the Pulverizer

All of the foregoing statements relate to plants designed so that the pulverized coal is stored adjacent to the boiler and fired through the medium of specially designed feeders. It may be well to mention at this point the firing of powdered coal direct from the mills without an interval of rest. Due to its apparent simplicity this method of firing has received considerable attention from time to time. There can be no question but that this method is practical, but it is not believed that it can ever be brought to the point of reliability and efficiency of the other methods, as there are so many factors governing the operation of the pulverizer and separator unit as to make it manifestly impossible to depend upon its delivery being sufficiently constant to maintain that uniformity and reliability necessary to efficient boiler operation. In these systems the same air is used for separation and for firing. It would be quite impossible to control this air so instantaneously as to prevent an excess at one moment closely followed by a deficit. This variation could easily occur within a few seconds and when the deficiency occurred it would result in the formation of CO which would go through the boiler unconsumed unless an excess amount of air was used at all times.

A very serious deficiency of this system from an operating standpoint is the lack of reserve supply of coal. Due to this lack any small mechanical trouble would necessitate shutting down the boiler. This lack of reserve supply also makes the peak demands of the auxiliaries coincident with the peak demand of the plant, whereas with a system where a bunker supply is maintained interruptions to pulverizing or conveying equipment does not interfere with boiler operation and the plant may be so designed as to prepare all coal during off-peak periods.

#### Installation Costs

Considerable stress has been laid upon the high first cost of powdered coal installations. It is not possible to give general figures that are of any value in connection with this method.



Oklahoma City Power Plant of Morris & Co. This shows triple installation for natural gas, pulverized coal and fuel oil



tion with these statements, as each powdered coal installation is a separate and distinctive engineering problem, but if two plants of equal size are considered from coal car to ash car, while the cost of the powdered coal plant will be greater than the stoker plant, the higher efficiency it is possible to maintain at low as well as at high continuous ratings, taken in connection with the reduction in standby loss, will in most cases show an average monthly saving sufficient to more than justify the additional first cost. If a modern central station using high grade Eastern coals and having an average load factor is taken as a basis for comparison, it is doubted whether the net saving in favor of powdered coal would be better than 10 per cent, but considering the price, such a station would pay for coal to-day, this saving would in most cases warrant the additional expense.

In an industrial plant having the usual varying mill load, the savings with powdered coal would be very much more than with any other method of firing, as the flexibility of powdered coal burning makes it readily responsive to the widely fluctuating demands of such practice and no small amount of saving occurs during the banked periods.

#### Comparative Operating Costs

It may be stated that the cost of firing coal, from coal car to ash car, is not greater in a pulverized coal plant than in a modern stoker plant. This conclusion is based on the following calculation, and is made on the basis that the extra steps necessary for the preparation of coal for firing in pulverized form, as against the firing of coal on either Type E or Multiple Retort stokers is offset by the cost of driving the stoker and blower auxiliaries in these latter plants.

It may be assumed that the power required to operate the forced draft fans for underfeed stoker and the power required for driving the stokers will be between 3 and 5 per cent. The stoker company will say that this is true, but that the net charge for power required to operate the stokers and deliver the air will not be more than 20 per cent of this figure, for the reason that the exhaust steam from the engines of turbines used for driving the fans and stokers is returned to the feed water, making the net charge for this power 1 per cent or less.

We have considered a plant with twenty 600 h.p. boilers and underfeed stokers of the Type E or Multiple Retort Type, and the steam required for operating the stokers and forced draft equipment, when developing 20,000 boiler h.p.

We have not considered the coal used for the dryer, for the reason that if the moisture is taken out in the dryer, it is not necessary to do it in the furnace, as would be the case if no dryer were used, or if the coal were being burned on underfeed stokers.

This plant, operating at 20,000 h.p., burns 31 tons of coal per hour, and the power required for preparing the coal is slightly less than 20 k.w. hr. per ton. This figure is based on the actual operation.

It has become the practice among engineers to estimate the power required for preparing the fuel at about 20 k.w. hr. per ton and making this a net charge. Therefore, if their cost per k.w. hr. was 1½ cents, they would figure a charge of 30 cents per ton for preparing the fuel.

The point we wish to make is that this preparation cost should be considered in the same manner as the cost of power for operating the fans and stokers, in order to have the two systems on a comparable basis. We have made our estimates with the idea of using in this plant a non-condensing turbo-generator of approximately 750 k.w. capacity. This is to supply power for the pulverized fuel system. This machine would operate with high pressure steam and exhaust at atmospheric pressure into the feed water heating system, the same as would be the case with the auxiliaries operating the stoker equipment. The steam consumed by this turbo-generator would be not more than 42 lbs. per k.w. hr. and on this basis the amount of steam required for preparing the fuel would be approximately the same as the steam required for operating the stoker equipment. Therefore, if the power required for operat-

ing the stoker equipment is considered as less than 1 per cent (taking into account the heat returned to the feed water) the power required for preparing the fuel in the pulverized fuel plant is the same, and instead of 30 cents per ton, is less than 6 cents per ton, if the total cost per k.w. hr. is taken as 1½ cents. The steam required for operating the pulverizing equipment in this plant would increase the temperature of the feed water approximately 36 degrees.

We believe that it is generally agreed that good stoker practice on continuous operation using Eastern coals will show approximately 70 per cent efficiency. With a correctly designed and properly operated pulverized fuel system, we believe that it is fair to assume that it can be operated continuously at 10 per cent higher efficiency than this, namely 77 per cent.

This conclusion is based on the results obtained on tests at the Milwaukee Electric Railway & Light Co.'s plant, and operating results at Oneida Street Station, Morris & Co. plant and St. Joseph Lead Co. plant.

Assuming that the plant considered above, operating on a 50 per cent load factor, will burn with stokers 400 tons per day and with a pulverized fuel system 300 tons, with \$8 coal this would represent a saving of \$116,800 per year, against which there would be charged interest and depreciation on additional cost of the pulverized fuel plant, which at the outside would not be over \$16,000, making a net saving of \$100,000 per year.

#### Slagging

Probably the greatest grief in the earlier attempts to burn powdered coal was trouble from slagging. Proper furnace design and correct air admission have practically eliminated this trouble, except with coals having a low fusing point ash, but even with such coals the trouble is confined to extreme high ratings when coal in excess of two pounds per cubic foot per hour is burned. This slag at extremely high ratings does not present any more serious problem than does the same condition of clinkering or slagging which occurs in stokers at extremely high ratings, and in powdered coal burning it does not interfere with the continuity of operation to the same extent that it does in stokers. At lower ratings, say, up to 150 or 200 per cent, with coals having ash with a high fusing temperature, no slagging occurs and the ash is in such shape that it is not necessary to remove the accumulation for several days, and this removal under these conditions simply necessitates raking the furnace out very much in the manner of cleaning the ash pits in any stoker practice. Under no conditions will there be any slagging of the tubes.

With ratings of 200 to 300 per cent carrying CO<sub>2</sub> around 15 per cent and due to the low excess air necessary to maintain such conditions, there would be a high temperature maintained in the furnace. When using coals with a low fusing point ash under this condition there would be considerable slagging of the ash as it accumulated at the bottom of the furnace, which would make this removal difficult. As many of the coals throughout the country have a low fusing point ash, much thought has been given to making operation with these coals at high ratings as simple and efficient as when using better coals. To this end a water screen connected into the boiler circulation has been developed and applied to a boiler at Milwaukee. This water screen performs two functions. First, it acts as a cooling screen so that the ash falling through it to the bottom of the furnace is cooled and the zone below the screen is maintained at a temperature below the fusing point. Second, it acts as a most efficient evaporating medium and produces one horsepower for approximately one square foot of heating surface. Results obtained with the screen so far have been most satisfactory. Operating at 200 per cent, CO<sub>2</sub> was easily maintained at 15 per cent and there was no more than 50 degrees difference between the temperature of the flue gases and the temperature of the saturated steam.

#### Deterioration of Brick Work

The deterioration of brick work that was looked upon as inherent in powdered fuel burning has not oc-

curred and it has been found in general practice that not only is the cost of furnace repairs less than with other methods of firing, but that boiler work has been greatly reduced, due to the more uniform furnace conditions that are maintained. Another item of economy is due to there being no metal parts in the fire zone, thus eliminating a costly item of upkeep.

#### Ash Disposal

A question frequently asked is, what becomes of the ash? It has been found by careful observation at Milwaukee that from 25 per cent to 50 per cent of the ash remains in the combustion chamber; that from 5 per cent to 12 per cent of the ash is collected in the second and third pass; that 25 per cent to 35 per cent is caught in the base of the stack and from 12 per cent to 25 per cent is lost through the stack. This stack emission does not, however, present any serious problem, as the ash thus emitted is a very fine, flocculent powder thoroughly calcined with no smudge, so that it is not likely that this will ever present any serious problem, though means for entirely eliminating it are being studied.

#### Discussion by H. G. Barnhurst\*

The principal point of interest in Mr. Savage's article and one which we have agitated for many years is the matter of design of combustion chambers for pulverized coal firing. We have always recommended large furnaces proportioned for the load in order to eliminate the erosive effect due to high velocity of gases of combustion passing through the furnace. Almost without exception, where the operation of the boiler is confined to the rating permitted by the fire box, high efficiency has been obtained. In the plants where the boilers have been designed exclusively for pulverized coal, with the maximum rating taken into consideration, conditions are almost ideal for varying loads.

Referring to the advisability of drying coal, it should be stated that this is largely a question of the percentage of moisture in the coal as received. Mr. Savage mentioned that it has been customary to state that in order to get good results, the coal must be pulverized to a fineness of 95 per cent through a 100-mesh screen and 85 per cent through a 200-mesh screen; and whereas we still believe that these recommendations for fineness should be generally followed so as to cover all coals, those who have had the most experience in the burning of anthracite and other low volatile coals are recommending that such coals be pulverized to even a higher degree of fineness. Pulverized coal should be dried not only on account of the burning conditions in the furnace, but also to eliminate the bad

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effect of excessive moisture upon the general handling of the coal, that is to say, in transporting, storing and feeding it to the furnaces.

The question of feeders has always been an interesting one and many combinations have been used, practically all of which involve screws operating in horizontal positions. With feeders of this type, there may be flushing of coal through the feeders at times, and in order to get away from this difficulty, we have recently adopted a vertical feeder.

The first commercial installation for burning pulverized fuel under boilers was made at the M. K. & T. R. R. shops, Parsons, Kan., under eight 250 hp. water tube boilers.

It would possibly be of interest to refer briefly to several steel plant installations involving the operation of steam boilers as well as metallurgical furnaces. In one of these, that of the Trumbull Steel Co., Warren, Ohio, probably the most interesting due to its size, the sheet mill department has a boiler plant and the usual equipment of slab, sheet, pair, annealing, galvanizing and tinning and boiler furnaces. When this plant is completed there will be over 100 metallurgical furnaces and several boilers, which will be operating exclusively with pulverized coal, requiring approximately 600 tons of pulverized coal per day.

The Newton Steel Co., at Newton Falls, has been using pulverized coal on a number of boilers, and on sheet and pair furnaces for some time. The Ashtabula Steel Co. is also installing a pulverized coal plant for furnaces of a similar type, in which installation there are two 440 hp. boilers which will be fired direct with pulverized coal.

At the plant of the American Chain Co., York, Pa., there are ready for operation two 18-ton air furnaces, connected with a 350 hp. Babcock & Wilcox 3-pass water tube boiler. This boiler is equipped with an auxiliary burner, making it possible to utilize practically all of the waste heat in raising steam, and at the same time developing the full rating of the boiler by the use of the auxiliary burner.

In the Bethlehem Steel Co. plant, Lebanon, the pulverized coal used under the four 500 hp. boilers is brought to the boiler house by means of a Fuller-Kinyon pumping system direct from the Fuller mills in the pulverizing plant, located approximately 850 feet away, through a single line of 4-in. pipe, making a number of turns, and elevating the coal approximately 45 feet.

In order to obtain the best efficiency with pulverized coal, care must be taken that suitable burners of a type that will permit a close regulation of the air supply for combustion be installed and also the furnace must be correctly designed for consuming efficiently the maximum amount of the fuel required by the loading conditions.

## Stainless Steel, Its Composition and Properties

### Manufacture and Uses—Influence of Temperature—Limits of Chromium Content

—BY ELWOOD HAYNES\*

WITH the discovery and manipulation of high-chrome steels, an alloy has been revealed and manufactured which resists corrosion to a most remarkable degree, and which is now termed stainless steel. Such a steel must contain iron, chromium and carbon, and may contain various other elements, such as manganese, molybdenum, tungsten, silicon, etc. Moreover, such a steel does not become distinctly immune to atmospheric influences until the chromium reaches at least 8 per cent, and only exhibits its highest quality when the alloy contains 11 or 12 per cent. Most of the combinations thus far in use contain from 12 to 20 per cent chromium as an essential constituent. An alloy of chromium with iron and carbon, containing as high as 60 per cent chromium, may be worked

to some degree under the hammer if extreme care is used in its manipulation.

If steels of this character be freed from adhering scale or rust, they will resist atmospheric influences to a marked degree, far excelling in this respect such metals as tin, nickel, lead, cobalt, copper, silver, etc., and such alloys as brass, German silver, Monel metal, etc.

For most purposes the carbon content of these steels should lie between 0.40 per cent and 0.80 per cent, while steels of considerably higher carbon may be utilized with advantage for special purposes.

#### Manufacture of Stainless Steel

The manufacture of these steels is comparatively simple, though the best results are obtained by means of the crucible or electric furnace. Those made by

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melting the steel in lined graphite crucibles, when proper precautions are taken, may be teemed into ingot molds, and show even less oxidation during pouring than the ordinary carbon steels. If the ingots thus produced are of small size, and hence readily chilled, they are usually quite hard when taken from the mold and require annealing before they can be worked on the lathe.

If small flat bars are heated to about 1500 to 1800 deg. Fahr., and allowed to cool in the air, they will become hardened to a very considerable degree, and for many purposes no further hardening will be necessary. If, on the other hand, extreme hardness is desired, the article may be quenched in oil or water.

After the ingot is removed from the mold it is placed in a clear fire (in which coke, oil, or gas may be used as fuel), and brought to a temperature of from 1500 to 1800 deg. Fahr., it may then be readily forged or rolled into bars. When properly heat treated it becomes highly elastic, and may be given almost any desired hardness by drawing at the proper heat. It shows practically no scale during the hammering process, and this fact largely compensates for the increased hardness of the hot metal over that of ordinary carbon steel. It may also be drop-forged under suitable dies, though it of course offers greater resistance and hence greater wear and tear on the dies.

#### Chemical Properties

As already stated, the chromium content of a stainless steel should be at least 12 per cent, and may rise as high as 25 per cent without seriously interfering with the workability of the steel, providing proper care is exercised. All things considered, a very good stainless steel may be made containing, say, 15 to 18 per cent chromium, with carbon ranging up as high as 0.80 per cent.

When such a steel is rolled or hammered into a bar and afterward heat treated and polished, it shows remarkable resistance to atmospheric influences. It may be exposed for months in a moist atmosphere, even in the vicinity of the ocean, without showing any sign of stain whatever. It may be immersed in salt water and remain indefinitely without change. It may be even boiled in nitric acid without losing its luster. It may likewise be dipped in a solution of sal ammoniac (ammonium chloride) and afterward exposed without washing to the atmosphere for an indefinite time without change. It is likewise immune to vinegar or mixtures of salt and vinegar, as well as to the action of citric acid. If the chromium be raised to 40 per cent or over and a small amount of molybdenum added, the steel will resist boiling solutions of salt and citric acid, even in the concentrated form.

#### Influence of Temperature

When a polished strip is heated in a Bunsen flame, it first takes on a pale straw color, then pale brown, gradually passing into a bright blue and finally culminating in a deep blue-black. Samples containing a suitable quantity of chromium may be held at a temperature of 800 to 1000 deg. C. for an indefinite time without showing any tendency to scale. The steel is much more rigid under high temperature than the ordinary carbon steels, and articles exposed to high temperatures would hence retain their shape much better under stress.

#### Physical Properties

As already stated, the steel may be forged at temperatures varying from 800 to 1200 deg. C. and may be readily rolled into rods and sheets under proper conditions. By proper annealing, a bar of 15 per cent chrome steel can be rendered sufficiently soft to be worked in the lathe, though even when annealed it is much harder than ordinary machinery steel. When thin strips are heated and allowed to cool in the air, they become almost file hard; and even ingots cast in thin flats in a graphite or steel mold are almost file hard even when allowed to cool in the air.

The steel yields to heat treatment quite readily, though its recalcence points are generally higher, and the steel does not respond so quickly to treatment as do the ordinary carbon steels. Complete data under

various heat treatments are lacking, but the following may be taken as fairly representative: Elastic limit, 115,000 lb. per sq. in.; tensile strength, 200,000 lb. per sq. in.; elongation, 2.50 per cent; scleroscope hardness, 80.

It will be noted that the elongation of the heat-treated steel of this character is rather low, but on the other hand, it is distinctly perceptible. It will be further noted that the ultimate breaking stress is considerably above the elastic limit, which indicates also that the steel is much tougher than a carbon steel of the same hardness.

#### Uses of Stainless Steel

The peculiar properties of stainless steel suggest its use for a great variety of purposes, such as pans, kettles, knives, forks, hatchets, axes, saws, chisels, etc. Indeed, all these utensils and instruments have been made from stainless steel with very good results. The alloy will also doubtless find larger use in the form of pump shafts, driving shafts, ships' propellers, etc. Its high modulus of elasticity and high tensile strength as compared with bronze especially recommend it for these latter uses. Its resistance to comparatively high temperatures, together with its tendency to retain its form, will doubtless render it of great service in the form of retorts for various operations such as gas making, shale distillation, and various other uses.

Owing to the comparatively high percentage of chromium, the cost of the steel will always be more than that of the straight carbon steels, but even so, it will doubtless find wide economic use because of its permanence and reliability under most trying conditions. Its application to concrete work which is exposed to salt water also suggests an important application of the steel.

#### Discussion by John L. Cox\*

The so-called stainless steels are typical products of the specialty steel plant, for their successful manufacture requires attention to detail quite inadmissible in a plant devoted to a tonnage output.

Most easily and successfully melted in the electric furnace, the ingots must be reheated and roughed before cooling—or be annealed—otherwise they will crack. With a carbon of 0.70 per cent or over, our practice is to rough under the hammer or in the mill, at about 2150 deg. Fahr. (1177 deg. C.), but with carbon about 0.35 per cent the steel works perfectly at 2250 deg. Fahr. (1232 deg. C.).

The roughed material will probably crack if completely air-cooled without being reheated and soaked for a while at a temperature below but near the  $A_c$  point, and, moreover, would be too hard to chip without this treatment, for it is self-hardening. Of the finished rolled bars a large proportion will crack where they touch the hot-bed rails, if cooled in the ordinary way. Before cooling too low they must be reheated, which can be done satisfactorily for the purpose at about 1350 deg. Fahr. for three-quarters of an hour and cooled either quickly or slowly, or they may be charged into heated pipes and in them annealed in the ordinary manner. Even at a rolling heat the material is unusually rigid and small sections are very hard on the rolls.

Chromium appears to raise the temperature of the carbon change point roughly 13.3 deg. Fahr. for each one per cent, at the same time lowering the magnetic or beta iron transformation point, so that with steels containing as much as 13 per cent of chromium the  $A_c$  point may be as far as 200 deg. Fahr. below the  $A_c$  point.

In a recent test, purposely and vastly accelerated by sandblasting all the surfaces compared, which is much to the disadvantage of the stainless steels, a high carbon, oil-hardened stainless steel, showed less discoloration after several days' exposure to alternating showers and sun, in the fume laden atmosphere of a steel plant, than did 98 per cent. nickel, Monel metal, copper, and a low-carbon stainless steel—being only surpassed by block tin, if by that. Polished, the supe-

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riority of both grades of stainless steel over the other metals, would have been evident.

It has been found that, to resist staining, carbon and chromium must be in a ratio varying with the extent of the carbon content, the chromium increasing at a decreasing rate as the carbon rises. Thus, 12 per cent chromium gives good results with carbon 0.30 per cent, a ratio of 40 to 1. With carbon 1 per cent chromium should be above 20 per cent, a ratio of 20 to 1, to secure first rate qualities.

Edged tools, tableware, cooking utensils, buckles, harness trimmings, etc., made of stainless steel should find a wide field of usefulness, especially in damp climates—particularly in the tropics, where iron and steel rapidly disappear.

#### Discussion by Dr. John A. Mathews\*

It is interesting to have a paper on the subject of Stainless Steel by one who is a pioneer in the study of complex alloy steels. It is also interesting to observe that the first investigations of alloy steels were made almost exactly a century ago. The materials for these investigations were assembled by Faraday and Stodart

\*President Crucible Steel Co. of America, New York.

at the Royal Institution in London, and sent by stage coach to Sheffield, where the melting was done in the works of the old Sanderson Brothers Steel Co. So far as I can learn, these were the first serious attempts at making alloy steels.

For the accomplishment of the second purpose stated by Faraday, the production of an alloy less susceptible to corrosion, we have had to wait almost one hundred years. During the past few years the alloy known as stainless steel has been developed. Its two principal applications are: First, resistance to ordinary corrosion and rusting by atmospheric or mild chemical attack at ordinary temperatures; and resistance to oxidation and scaling at very high temperatures. These two valuable properties make possible its two principal applications: First, its use in table cutlery; and, second, its use for gas engine valves.

We pride ourselves upon being a progressive people, yet in the matter of adopting stainless steel for general use we are far behind our conservative British cousins. Its use in Great Britain in its various applications has gone ahead very much more rapidly than it has in America. There are signs, however, that this valuable material is increasing in popularity, and, with the return of normal business conditions, we should expect to overtake and exceed in the use of stainless steel.

## Manufacture and Properties of Molybdenum Steels

Their Adaptability to Fabrication and Their Cost—Comparison With Other Alloy Steels

BY ARTHUR H. HUNTER\*

A GREAT deal has been published recently on the action of molybdenum in steel considered primarily from a technical standpoint. A summary of the purely practical and commercial features of this alloy might be of greater interest at present than a more technical résumé and with this in mind the following is presented. From the strictly practical viewpoint there are, broadly speaking, four prime factors to be considered in connection with any steel:

- The manufacture of the steel itself.
- The physical properties of the finished steel.
- The adaptability of the steel to fabrication.
- The total cost of the fabricated article.

#### Manufacture of Molybdenum Steel

The production of some 50,000 tons of molybdenum steel has served to place melting practice on a firm basis. Molybdenum may be added to the electric or open-hearth bath either in the form of calcium molybdate or ferromolybdenum. Greater precautions are necessary in the open-hearth with the former than with the latter. In this type of furnace the method which has been found most advantageous is to make the addition as the charge is melting down and before the slag has formed. This practice insures a complete and uniform diffusion of the molybdenum through the steel. In this process nearly all of the molybdenum remains in the steel and losses, whether mechanical or due to volatilization and oxidation, are extremely small. The molybdenum in scrap can be recovered when remelted in like proportion to the original addition. The total alloy efficiency in average practice is well over 90 per cent. In the electric furnace the positive control of slagging and atmospheric conditions renders an even higher recovery possible.

#### Physical Properties of Finished Steel

Molybdenum steels, as a class, when compared with other alloy steels which are in the same category from a commercial standpoint, treated to the same tensile strength, show:

A slightly higher elastic limit, hence a somewhat higher elastic ratio.

A higher elongation, hence greater ductility.

A much higher reduction of area, hence appreciably greater toughness.

This latter property is probably the most pronounced individual physical result of the addition of molybdenum to steel. From a great deal of data covering these three points, the writer has chosen the following tests, made under the supervision of Dr. J. S. Unger of the Carnegie Steel Co., as exemplifying them in the simplest manner.

Five steels, embracing only the accepted commercial tonnage types, analyzing as shown in Table 1, were all heat treated to give the same tensile strength, i.e., approximately 125,000 lb. per sq. in.

Table 1—Analyses and Physical Properties of Five Representative Steels

Type of Steel	C	Mn	Ni	Cr	Mo
1. Carbon .....	0.62	0.45	....	....	....
2. Chrome .....	0.49	0.53	....	0.60	....
3. Nickel .....	0.40	0.65	3.61	....	....
4. Chrome-nickel .....	0.43	0.57	1.60	0.46	....
5. Chrome-molybdenum.	0.32	0.72	....	0.80	0.27

Type	Tensile Strength, lb. per sq. in.	Elastic Limit, lb. per sq. in.	Elastic Ratio	Elongation in 2 in. Per Cent	Reduction of Area Per Cent	Izod Foot Pounds
1. Carbon .....	126,175	84,380	66.9	18.0	42.6	5.0
2. Chrome .....	125,300	107,225	85.6	18.0	56.5	66.5
3. Nickel .....	127,975	112,525	87.9	18.8	81.4	54.5
4. Chrome-nickel	127,975	111,025	86.8	19.8	60.3	54.0
5. Chrome-molybdenum	125,650	112,250	89.3	21.0	68.0	90.0

Compared with the carbon steel, the chrome-molybdenum showed 33 per cent increase in elastic ratio, 16-2/3 per cent increase in elongation and 56 per cent increase in reduction of area. Compared with the nearest alloy steel, the chrome-molybdenum showed 1.7 per cent increase in elastic ratio, a little over 6 per cent increase in elongation and 12.8 per cent increase in reduction of area. The tensile strength of all these steels having purposely been made the same, the only possible variables were these three.

The physical merit of a steel depending upon the relation of all its properties, it is the cumulative effect of the increase of each that gives to the molybdenum

\*President Atlas Crucible Steel Co., Dunkirk, N. Y.

(Continued on page 1511)

# Steel Foundry Rearranged and Enlarged

Cupolas and Converters Replaced by Electric Furnace—Various Departments Relocated in Interests of Orderly Sequence of Operations

—BY GILBERT L. LACHER\*

TO modernize and enlarge a foundry in such a manner as to get the most out of existing facilities and to so co-ordinate them with those of the addition to secure maximum production at minimum cost, constitutes a more difficult problem than constructing an entirely new plant. Further complexities are added when expansion must be accomplished with due regard to the maximum future development of the property. All of these considerations were involved in remodeling the plant of the Chicago Steel Foundry Co., Chicago. A study was first made of the original works, to determine whether it could be developed to maximum productive capacity without constructing additional buildings. Investigation disclosed that the best results could not be obtained, because a number of departments were overcrowded and too small, thereby limiting the output of other parts of the plant. It was therefore decided to construct an addition to the foundry and to change the location of certain departments. At the same time it was determined to install an electric furnace to take the place of cupolas and converters.

The furnace is of the removable top type and was constructed by the Industrial Electric Furnace Co., Chicago. It has a rated capacity of  $3\frac{1}{2}$  tons, but as much as  $4\frac{1}{2}$  tons have been tapped from it. Its average consumption of electricity per ton is 600 kw., and the lowest consumption per ton, thus far recorded, was 480 kw. In 150 consecutive operations the time of the first heat averaged 2 hr. 37 min., for the second heat 2 hr. 7 min., and for the third heat 1 hr. 55 min. The best time achieved up to date was 1 hr. 15 min. The removable top has reduced charging time materially. Before each heat the top is lifted back by electric motor and a drop bottom bucket is lowered by overhead traveling crane and drops the charge into the furnace. The average charging time is less than 5 min., whereas a trial of hand charging through the side charging doors of the furnace disclosed an average time consumption of 20 min. An interesting feature of the operation of the furnace is the fact that

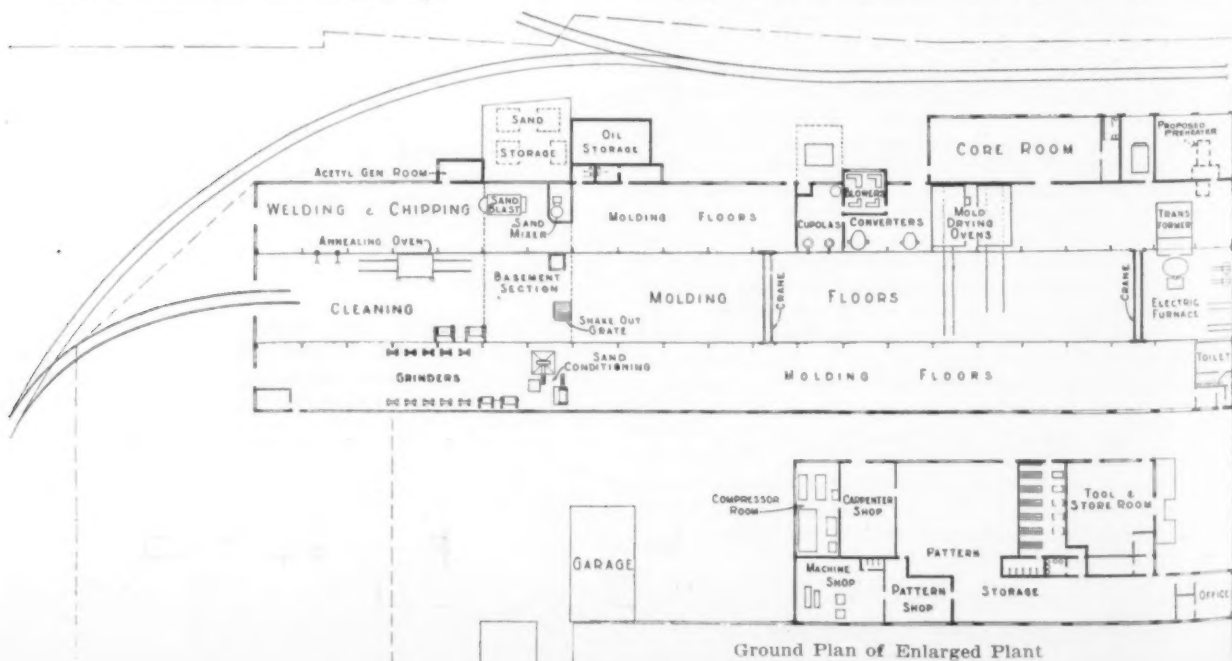
steel of the analysis used in pouring molds is made in the furnace and is not subsequently reduced by introducing alloys into the ladle.

Current for the operation of the furnace is bought untransformed from the Commonwealth Edison Co., Chicago, and is stepped down by a 1500-kva. Pittsburgh Transformer Co. transformed to either 180 or 90 volts. The transformer room is entirely inclosed and admittance is granted only to those who are authorized to enter. All high tension equipment is carefully guarded.

The furnace is equipped with three 7-in. graphite electrodes, each of which is raised and lowered independently of the others. The electrodes are held in cranes which operate in vertical slides and may be controlled either by hand or automatically by electric motor. At the Chicago Steel Foundry plant it has been found that the best results are obtained by regulating the electrodes by hand wheel for about ten minutes before throwing over to the automatic control. Each electrode crane is served by a 2-hp. General Electric d.c. reversing motor. The motor is connected with a cable drum and, by winding or unwinding the drum, raises or lowers the electrode crane. The height of each crane, hence the position of the electrode in the furnace, is automatically regulated by the amount of current flowing. As a safety measure automatic stops have been provided, both at the top and bottom of each slide, to disconnect the motor when the crane reaches those points. The automatic push button control for raising and lowering the electrode crane was furnished by the General Electric Co.

The electrode-holders are water-cooled and may be tightened or loosened by worm gears from the back of the furnace. Thus the operator is protected from the heat. In ordinary practice when an electrode breaks off, a new nipple and section are screwed on the top and the electrode is fed down to the desired point. The difficulty with this method is that the work must be done on top of the furnace, which is obviously a hot place to stand, and considerable time is consumed in performing the operation. To overcome these disadvantages, the Chicago Steel Foundry Co. keeps a rack

\*Western editor THE IRON AGE, Chicago.



Ground Plan of Enlarged Plant



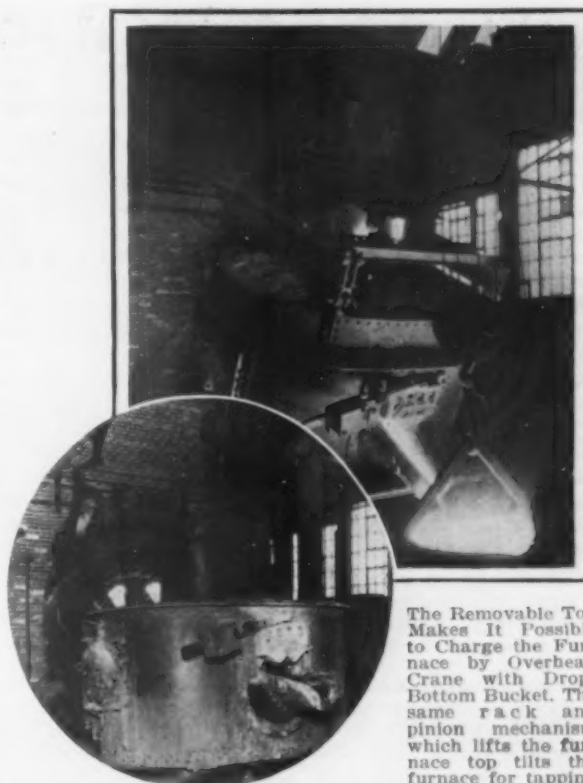
full of spare sets of electrodes, each consisting of three sections of graphite screwed together, and when an electrode breaks in the furnace it is removed in entirety and a new electrode set is inserted in its place. The broken electrode set withdrawn from the furnace is placed in a rack where it is permitted to cool before a new section of graphite is added to it. The time saving through this practice is considerable, as it has been found at the Chicago Steel Foundry plant that a heat can be removed from the furnace, a broken electrode can be replaced and charging can be done in less than 20 min.

The 90-volt current is used for refining, better results being obtained with shorter arcs than with those used for rapid melting.

At the conclusion of a heat the furnace is tilted for tapping by rack and pinion, operated by a 3-hp. General Electric motor. As many as 14 heats, yielding a total of 50 tons, have been obtained when operating the furnace 24 hr., while 21 tons have been melted in an ordinary day shift. When the furnace was first put into operation on Dec. 20, 1920, it was primarily to give the installation a preliminary trial. Operation has been practically continuous since that date and the electric furnace has been used exclusively for steel production in the foundry, whereas the cupolas and converters have been abandoned. A minimum of repairs has proved necessary. It is thought that the design of the furnace is conducive to its longevity. The roof of the furnace is exceptionally high and to that fact is attributed the freedom from torn down linings.

The electric control panel containing the oil switches controlling the transformers and the push buttons operating the elevating motors, etc., was furnished by the General Electric Co. A safety switch, by which all current may be shut off in an emergency, was supplied by the V. V. Fittings Co., Philadelphia.

To further increase the output of the electric furnace the Chicago Steel Foundry Co. is installing an oil-fired preheating furnace of special design. Scrap will be elevated in buckets along a runway, similar to the skip hoist on a blast furnace, and will be charged into muffles, through which it will pass by gravity through the preheating furnace. After preheating, doors will be opened at the discharge end of the muffles and the preheated scrap will be discharged into drop bottom buckets, which will be lifted by overhead crane for charging the electric furnace. The preheater also is being furnished by the Industrial Electric Furnace Co., Chicago. On the basis of results obtained with preheaters elsewhere, the manufacturer expects the preheating to increase the output of the furnace 50

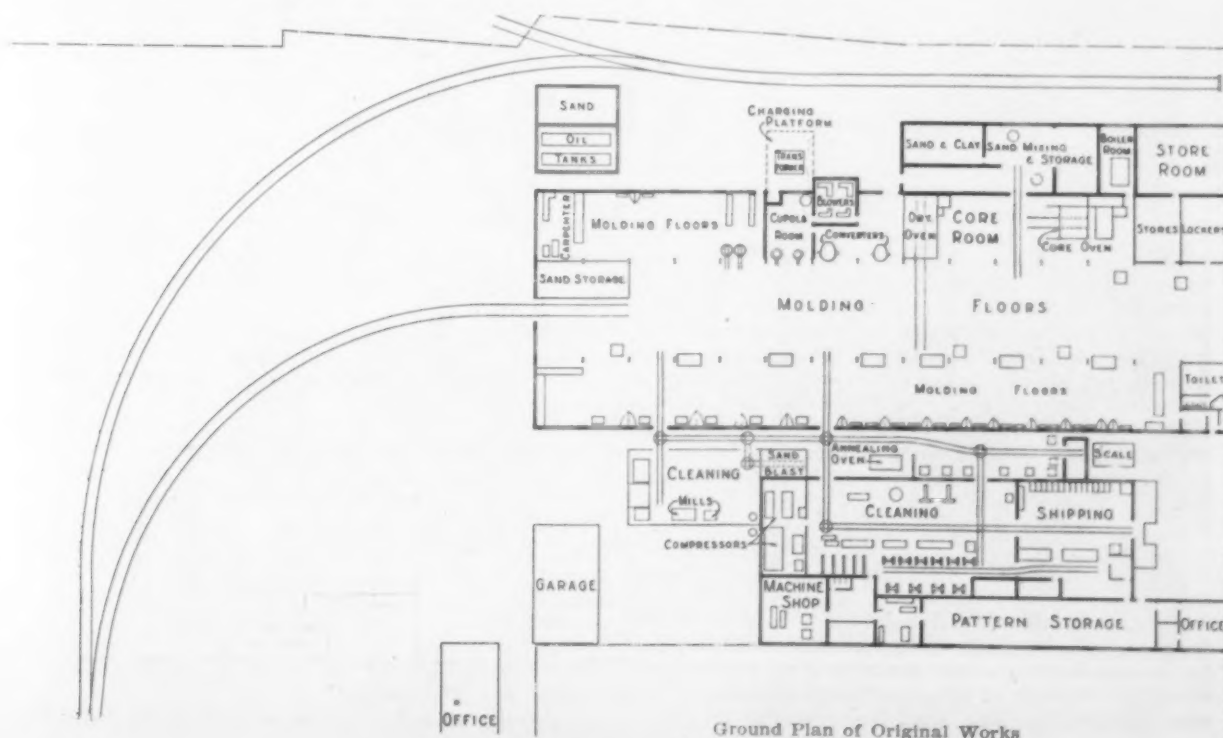


The Removable Top Makes It Possible to Charge the Furnace by Overhead Crane with Drop-Bottom Bucket. The same rack and pinion mechanism which lifts the furnace top tilts the furnace for tapping

per cent and to reduce the electrical consumption 40 per cent, so that three-ton heats can be obtained every hour, including charging time.

#### Departmental Arrangement of Plant Changed

The enlargement of the foundry involved making material changes in the departmental arrangement. What was done is best grasped by referring to the plan views of the old and the enlarged plant. A study of the original works disclosed the fact that the molding area and the melting equipment were ample for a production of 315 tons of castings per month, but the size of the core room and the capacity of the core oven were inadequate for this output. It was found that the cleaning department was too small and material handling through this department was costly. The department to which the castings were brought from the foundry for sand blasting and tumbling, formed a pocket. Only a 10 ft. passageway was available for the move-



Ground Plan of Original Works

ment of castings from the sand blast and tumbling department to the grinding, chipping and welding room. Here lack of sufficient space caused congestion around the grinders. The shipping room adjacent to the cleaning department had no facilities for rail shipments and all finished castings for shipment by freight car had to be trucked 180 ft.

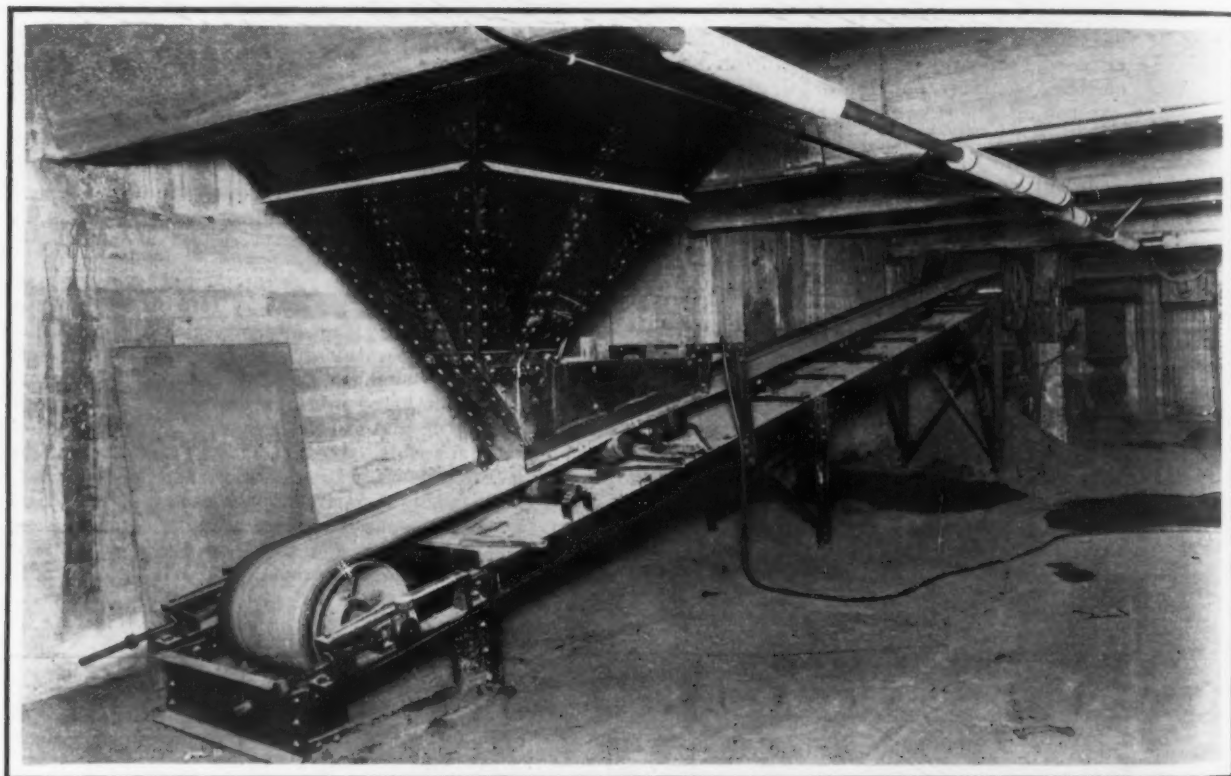
The engineers therefore decided to extend the foundry building proper 140 ft. and to house in this addition all cleaning and finishing equipment. A spur from the railroad adjacent to the plant was extended into the end of this structure to make possible the loading of shipments into cars under the plant roof. The building which had formerly contained the cleaning and chipping departments was remodeled to provide more room for pattern storage, machine shop, tool and store room, carpenter shop and pattern shop.

The addition to the foundry building proper was constructed in such a manner that the craneway could be extended, but differed somewhat in design in that the roof over the main bay was built higher than the old roof to provide better ventilation and lighting. The roof over the main bay of the old structure was not high enough in proportion to the side bays to insure proper ventilation. The roof was therefore raised to allow for additional sash and was made to conform to the design of the addition as nearly as possible.

trucks through an aisle back of the molding benches, where it is dumped in piles next to the benches.

When the cars are dumped on the shake-out grate the castings are removed and carried forward for sand blasting, tumbling, grinding, chipping, etc. The sand shaken out drops through a hopper to a continuous belt conveyor located in the basement. The conveyor carries the sand forward to a magnetic separator, where metal impurities are removed and the sand is then discharged in a bucket elevator which carries it to a revolving screen. The screened sand drops into a hopper leading into another bucket elevator, which carries it up and deposits it on a conveyor, which throws it against a revivifier. The latter consists of a solid disc with studs projecting from the circumference and revolves at great speed. A water spray plays on the sand as it passes over the belt into the revivifier. After revivification the sand drops into a 30-ton hopper, under the discharge spout of which hopper trucks are moved to be loaded. The cycle of sand conditioning from shake-out grate to the 30-ton hopper is accomplished in three minutes.

A sand and fire clay storage was constructed adjacent to the section of the foundry addition containing the basement. This storage is located near the railroad siding, so that sand and fire clay can be transferred directly from railroad cars to storage by locomotive



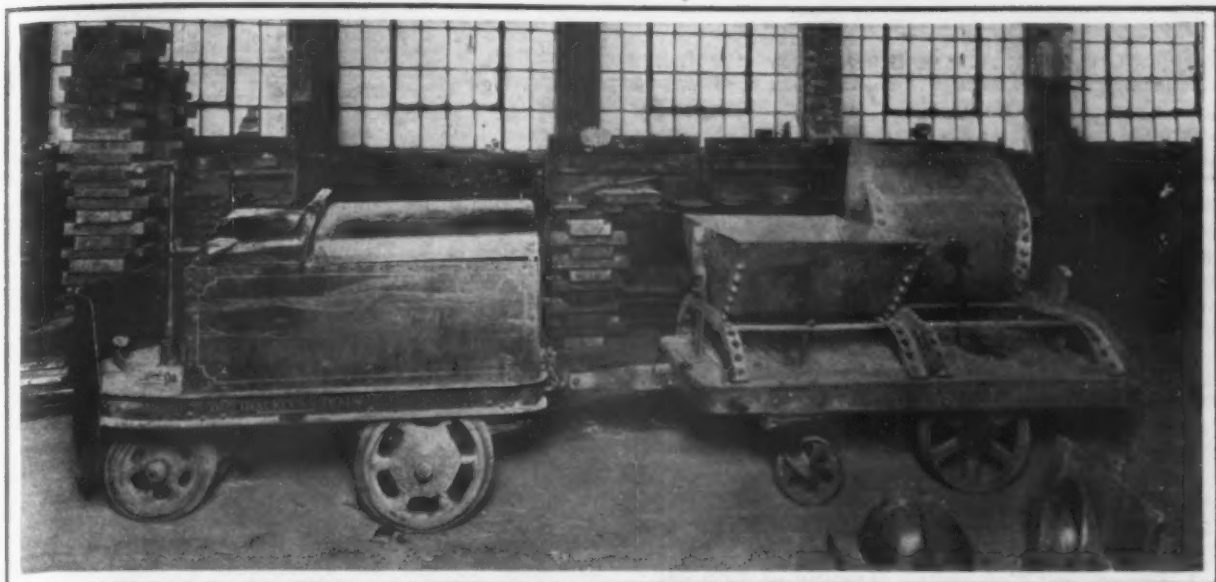
Sand Drops from the Shake-Out Grate through a Hopper to a Belt Conveyor in the Basement. The conveyor carries the sand to a magnetic separator from which it is discharged into a bucket elevator which carries it to a rotating screen

A feature of the addition is the sand conditioning equipment. This was designed by the C. O. Bartlett & Snow Co., Cleveland, in co-operation with the engineers. To promote the freest movement of sand to and from the conditioning equipment, the engineers recommended flat wheel transportation and accordingly the industrial track system was abandoned and concrete aisles were laid on each side of the molding floors. The trucks used for hauling molds and sand were designed by the foundry company's own engineers. Mounted on this type of truck are one or two hoppers, on the bottom, or end, of which are teeth which engage holes in a rack below. A key which is fitted in a slot on the end of the hopper holds it in normal position. For dumping, the key is removed and the hopper is rolled on its side. The molds are lifted into the hoppers directly from the molding floor, whereupon the cars are hauled by storage battery motor truck to a shake-out grate, where the contents of the hoppers are discharged. Likewise screened molding sand is hauled by the hopper

crane, the material being dropped through hatchways in the roof of the storage. The storage has a capacity of 25 cars of sand and five cars of fire clay. From storage, sand is transferred to a motor-driven Simpson mixer, also in the basement. The method used in elevating the sand to the mixer is of interest. The sand is taken by wheelbarrow and dumped into a large scoop, the bottom of which is resting on the floor of the basement. The discharge end of the scoop is pivoted on a steel truss at a point just above the top of the mixer. For dumping, the bottom of the scoop is raised by cable, driven by the same motor which operates the sand mixer, until it reaches a point where the sand will pass by gravity into the mixer. After mixing, the sand is dropped through the bottom of the mixer into drop bottom buckets, which are carried by buggy to a point under an opening in the foundry floor, through which they are lifted by overhead traveling crane and distributed.

On the main floor of the addition to the foundry are





For Hauling Molds to the Cleaning Department and for Bringing Screened Sand Back to the Molders' Benches the Company Designed a Hopper-Type of Truck. Teeth on the bottom of the hoppers engage holes in racks below so that dumping may be accomplished by rolling the hopper on its side. A key fastened to the rack below is inserted into slot on the end of the hopper to hold it in normal position. An aisle back of the molders' benches, to be noted in the photograph, is used when bringing screened sand for the use of the molders. Spaces for sand piles have been provided next to the molders' benches

located a George Whiting Co. spruce cutter, one Whiting Corporation and two W. W. Sly Mfg. Co. tumbling barrels, a number of grinding machines, including two radial grinders, an annealing oven, a sand blast, pneumatic tools for chipping, both electric and oxy-acetylene torches, and a weighing scale. The sand blast equipment was furnished by L. O. Koven & Brother, Jersey City, N. J. The annealing oven was constructed by the Hofmann Engineering Co., Chicago, and is fired by eight oil burners, four on each long side of the furnace. The oven is equipped with a Bristol Electric Co. pyrometer, the annealing temperature ordinarily sought being from 1600 to 1650 deg. Fahr. The automatic dial scale is of 2000 lb. capacity and was manufactured by the American Krone Scale Co., New York.

The foundry is equipped with three 5-ton overhead electric traveling cranes. Two of these were manufactured by the Northern Engineering Works, Detroit, and the third by the Whiting Corporation, Harvey, Ill. A 12-kw. converter furnished direct current for the motors of the cranes, while a 10-kw. converter serves the

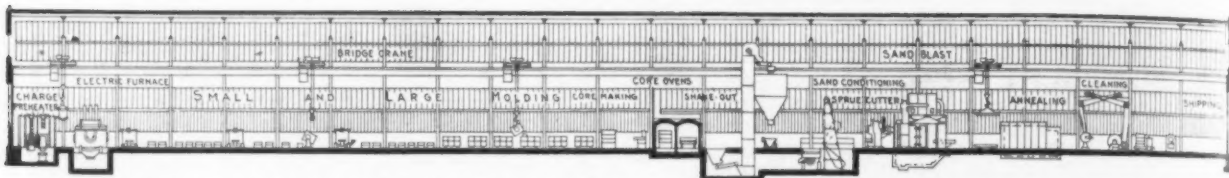
magnet in the sand separator. Other power is secured from current furnished by three 150-kva. transformers, which step down the purchased current from 12,000 volts to 220 and 110 volts. Other features of the plant are an oil storage, located adjacent to the railroad siding, and an acetylene generating room where gas for the oxy-acetylene torches is generated. The generating equipment was furnished by the Oxweld Acetylene Co., Newark, N. J.

A feature of the foundry addition is the dust collecting system. A dust tunnel has been laid under the floor, extending from the sand blast to the tumblers, thence to the grinding machines and then to the chipping room, leading finally to a dust arrester outside of the structure.

Frank D. Chase, Inc., Chicago, was the engineering firm in charge of the enlargement and remodeling of the plant. This company has also worked out plans for the future development of the property. In the event of expansion the present cleaning room will be given over to additional molding area, leaving the sand con-



The Screen Drops Sand into a Hopper from Which It Is Discharged to the Bucket Elevator Visible in the Foreground. The elevator carries the sand to the water spray and revivifier from which it drops into the 30-ton hopper, to be noted at the left. The residue in the rotating screen is dropped into a chute to be seen at the extreme right, and discharged into wheelbarrows



Longitudinal Cross Section of Foundry, Drawn to Show the Location of the Equipment to the Best Advantage

ditioning apparatus centrally located. The cleaning and shipping departments will be moved into a new building to be located at right angles to the present structure and in time, additional molding area will be provided there. The ultimate layout will utilize to the utmost all of the property available.

As it now stands, the plant of the Chicago Steel Foundry Co. consists of a main foundry building 440 ft. in length and 150 ft. wide for about one-half that distance and 100 ft. wide for the remaining distance, and a building, 65 x 160 ft., containing pattern storage, machine and carpenter shops, etc.

#### International Commerce Meeting in London

The first conferences of the International Chamber of Commerce will be held in London in the week of June 27. Delegates to the conference will be organized into five groups. Walker D. Hines, formerly director general of the United States Railroad Administration, will be chairman of the group for transportation and communication, while the chairmen of the other four groups will be Dr. Walter Leaf, Great Britain, for finance; Eugene Schneider, of the Creusot works, France, for production; Marco Cassin, Italy, for distribution; and M. Verwilghen, Belgium, for devastated regions. Willis H. Booth, New York banker, is chairman of the American committee on finance. He will be assisted among others by E. J. Cornish, president National Lead Co., New York, production raw material committee; Alba B. Johnson, president Philadelphia Chamber of Commerce, Philadelphia, fabricated production committee; H. H. Raymond, president Clyde Steamship Co., New York, ocean transportation com-

mittee; Lewis B. Stillwell, consulting engineer, New York, port facilities committee; John J. Carty, vice-president American Telephone & Telegraph Co., New York, communications committee.

#### Kalman Co.'s Proposed Plant

The Kalman Co. of Chicago, manufacturer of steel reinforcing materials, operating plants in Chicago and St. Louis, will build a third plant at Youngstown, Ohio, in the fall, to take care of its Eastern business. The manufacturing building will be 400x420 ft., according to present plans, and will involve an expenditure of \$200,000. It will use approximately 70,000 tons of steel products annually, when operating normally, its principal requirement to consist of steel bars. Actual commencement of construction is contingent on the laying of 1500 ft. of railroad to connect with the Pennsylvania system.

#### Corporation Granted Extension

WASHINGTON, May 31.—The Federal Trade Commission granted a request of the United States Steel Corporation for extension of time for making formal answer to the complaint of the commission in the so-called Pittsburgh-plus case. It is understood that the answer, which was to have been filed by Friday, May 27, will be made the latter part of the current week. At the Federal Trade Commission, it was stated the extension had been granted for a week or ten days, and if the longer period is required, the answer would not be filed till the forepart of next week.



Sand from Storage Is Dropped by Wheelbarrow into a Scoop Which Is Raised for Dumping into the Sand Mixer



## CENSUS OF MANUFACTURES

## Five-Year Comparison Shows Increase in Values of Product of 100 to 250 Per Cent

WASHINGTON, May 31.—Values of products of blast furnaces and iron and steel plants increased from almost 100 to approximately 250 per cent in 1919 as compared with 1914, according to a preliminary statement of the 1920 census of manufactures issued by the Bureau of the Census. For all industries reporting in 1919, including establishments of every description, to the number of 288,376, the value of their products reached the enormous total of \$62,588,905,000, as compared with 275,791 establishments whose products in 1914 were valued at \$24,246,435,000.

The increases in the values of products of iron and steel plants are shown by citing a few of the major items. The value of products of 195 blast furnaces in 1919 is placed at \$794,467,000, as compared with 160, with a value of \$317,654,000 in 1914. The average value of products per furnace plant, based on these figures, therefore, was \$4,074,189 for 1919 and \$1,985,337 for 1914. The value of products of 484 steel works and rolling mills in 1919 is placed at \$2,812,775,000, or \$5,807,390 for each establishment, and 427 in 1914 at \$918,665,000, or \$2,128,021 for each average establishment.

These and other figures are given in the following table:

Industry	Number of Establishments		Value of Products	
	1919	1914	1919	1914
Iron and steel, blast furnaces.....	195	160	\$794,467,000	\$317,654,000
Iron and steel, steel works and rolling mills.....	484	427	2,812,775,000	918,665,000
Iron and steel, bolts, nuts, washers and rivets, not made in rolling mills....	147	102	91,655,000	23,403,000
Iron and steel, cast-iron pipe.....	59	59	50,235,000	26,659,000
Iron and steel, doors and shutters.....	57	43	10,877,000	5,184,000
Iron and steel, forgings, not made in steel works or rolling mills.....	240	191	171,676,000	28,961,000
Iron and steel, nails and spikes, cut and wrought, including wire nails, not made in steel works or rolling mills.....	64	64	17,555,000	7,199,000
Iron and steel, case-hardened, tempered, or otherwise specially treated, including welding.....	522	..	11,030,000	..
Iron and steel, wrought pipe.....	51	36	84,011,000	37,655,000
Tin plate and terneplate.....	23	31	97,399,000	68,343,000
Wire.....	66	54	162,152,000	81,841,000
*Not including the tin or terneplate of rolling mills, 16 in number, with products valued at \$82,920,668: total for the industry proper and the rolling mills, 39 establishments, \$180,319,388.				
Agricultural implements.....	519	601	304,939,000	164,087,000
Aluminum manufactures.....	84	37	69,474,000	19,597,000
Ammunition.....	43	32	88,059,000	30,840,000
Automobile bodies and parts.....	2,394	971	673,590,000	129,601,000
Automobiles.....	315	300	2,387,833,000	503,230,000
Automobile repairing.....	15,486	3,273	222,596,000	29,920,000
Brass, bronze and copper products.....	1,122	992	487,707,000	162,199,000
Carriage and wagon materials.....	258	456	26,765,000	24,850,000
Carrriages and sleds, children's.....	104	92	24,508,000	11,752,000
Carrriages and wagons, including repairs.....	2,288	4,601	91,754,000	106,697,000
Cars and general shop construction and repairs by electric railroad companies	621	649	74,461,000	38,577,000
Cars and general shop construction and repairs by steam railroad companies	1,750	1,362	1,277,584,000	514,041,000
Cars, electric railroad, not including operations of railroad companies.....	7	14	18,442,000	10,495,000
Cars, steam railroad, not including operations of railroad companies.....	89	103	539,528,000	194,776,000
Cash registers and calculating machines.....	65	52	83,158,000	30,520,000
Coal-tar products.....	183	..	135,482,000	..
Coke, not including gas-house coke.....	253	231	299,879,000	99,275,000
Copper, tin and sheet-iron work.....	4,790	4,527	160,932,000	94,891,000
Crucibles.....	23	10	6,139,000	1,886,000
Cutlery and edge tools.....	302	252	62,526,000	25,541,000
Electrical machinery, apparatus and supplies.....	1,403	1,030	884,343,000	325,170,000
Engines, steam, gas and water.....	372	446	464,909,000	72,121,000
Ferroalloys.....	31	..	40,640,000	..
Files.....	50	48	17,617,000	5,608,000
Firearms.....	26	29	30,179,000	10,544,000
Fire extinguishers, chemical.....	32	27	5,620,000	1,298,000
Foundry and machine-shop products.....	10,918	10,640	2,321,129,000	866,545,000
Foundry supplies.....	79	57	9,968,000	2,013,000
Machine tools.....	403	..	212,225,000	..
Shipbuilding, steel.....	159	79	1,454,116,000	66,217,000
Smelting and refining, copper.....	33	37	632,897,000	444,022,000
Smelting and refining, lead.....	25	22	192,655,000	171,579,000
Smelting and refining, zinc.....	28	29	103,103,000	53,538,000
Smelting and refining, metals, not elsewhere specified.....	7	..	13,996,000	..
Steel barrels, drums and casks, portable.....	34	..	24,943,000	..
Stoves and hot-air furnaces.....	416	433	145,772,000	67,941,000
Stoves, gas and oil.....	176	113	55,874,000	21,449,000
Structural ironwork, not made in steel works or rolling mills.....	1,147	1,235	304,961,000	159,278,000
Textile machinery and parts.....	432	..	121,014,000	..
Tools, not elsewhere specified.....	1,126	661	145,112,000	32,893,000

## Conference on Weights and Measures

WASHINGTON, May 31.—Discussion of the metric system came up so late at the fourteenth annual conference on weights and measures, which closed its sessions at the Bureau of Standards last Thursday, that it was decided not to take any action on the question until the next conference, when it will be made a spe-

cial order of business. Among those who addressed the conference was Representative Britton of Illinois, who has introduced a bill in Congress for the adoption by the Government of the metric system. This measure is looked upon as an entering wedge to compel private industries to adopt that system, and is being strongly opposed by many industries which would be affected.

Delegates to the conference were received on the last day of the session by President Harding. Dr. S. W. Stratton, Chief of the Bureau and president of the conference, presented the 100 or more sealers of weights and measures to the President, who assured them of his great interest in the work which they are doing.

Dr. Stratton was re-elected president. The major proportion of the regular business session was given over to a discussion of the report of the committee on specifications and tolerances chiefly as they relate to gasoline.

A new publication of the Bureau of Standards, Scientific Paper No. 410, entitled "Thermal Expansion of Copper and Its Important Industrial Alloys," gives data on the thermal expansion of 128 samples of copper alloys of various compositions (56 to 100 per cent copper); heat treatments, mechanical treatments, etc., are presented. Definite mathematical relations were found to exist between the instantaneous coefficients of expansion and the copper content of most of the alloys investigated. In general, the coefficient of ex-

pansion increases with a decrease in the copper content. The addition of lead or tin has a decided effect on the coefficient; the former element generally decreases, and the latter increases, the coefficient. The effects of cold working were also studied. For example, the coefficients of cold rolling copper zinc alloys, containing from about 62 to 90 per cent copper, are greater than the coefficients of corresponding castings.

# Exports Drop to Lowest Point in Seven Years

Movement of Iron and Steel Was Only 162,592 Tons in April—Decline in Prices as Well as in Tonnage—Machinery Exports Also Smaller

WASHINGTON, May 31.—Continuing the downward trend which they developed in February, iron and steel exports for April showed a further marked slump and those listed in THE IRON AGE table for the latter month aggregated only 162,592 gross tons or 29.5 per cent less than those for March, which amounted to 230,635 tons. Their respective values, \$49,609,605 and \$87,-

When compared with exports for April, 1920, amounting to 408,248 tons, those for the same month of this year show the striking decline of 61.3 per cent and give an indication of the world-wide slackening in business since one year ago. Imports in April, 1920, at 29,682 tons, compare with 7027 for April of this year.

While the April outward movement showed a decline, imports, though not large, were decidedly in an upward direction, amounting to 7027 gross tons, as compared with 5323 gross tons in March, an increase of 32 per cent. The value of imports also reflected lower prices at which foreign makers are shipping, in an effort to find markets, and the interesting fact is exhibited of the much larger April imports being valued at only \$2,779,203, as against \$2,835,363 for the much smaller importations of March.

Machinery exports for April also shared in the

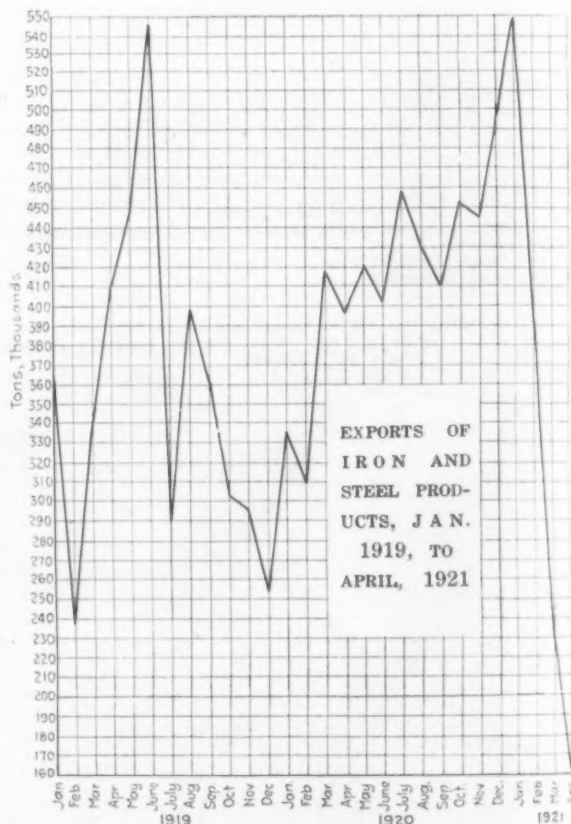
	Imports of Iron and Steel		Gross Tons	
	April		Ten Months Ending April	
	1920	1921	1920	1921
Ferromanganese.....	3,018	2,115	29,298	42,657
Ferrosilicon.....	633	191	13,820	6,659
All other pig iron.....	12,109	2,781	100,933	45,195
Scrap, including tin plate scrap.....	7,818	1,284	184,105	80,461
Bar iron.....	179	10	2,641	3,468
Structural iron and steel.....	136	74	958	1,250
Steel billets without alloys.....	2,428	3	21,551	750
All other steel billets.....	289	128	3,005	3,271
Steel rails.....	2,742	298	10,569	28,744
Sheets and plates.....	192	2	1,182	2,378
Tin and terne plates.....	29	79	312	463
Wire rods.....	109	62	688	4,578
Total.....	29,682	7,027	369,062	219,874
Manganese ore and oxide of.....	35,088	47,260	186,986	610,938
by value.....	\$3,307,050	\$2,779,203	\$28,440,381	\$38,579,033

496,206, showed an even greater variance, reflecting not alone the let-up in volume of business but the drop in prices. The April exports were at an annual rate of slightly less than 2,000,000 tons, or only about 5 per cent of the steelmaking capacity of the country.

The exports of iron and steel for April, of 162,592

	Exports of Iron and Steel		Gross Tons	
	April		Ten Months Period Ending April	
	1920	1921	1920	1921
Ferromanganese.....	33	218	1,965	3,335
Ferrosilicon.....	.....	.....	333	523
All other pig iron.....	14,575	1,234	216,793	121,451
Scrap.....	5,468	2,662	37,904	174,745
Bar iron.....	3,131	311	29,689	38,092
Wire rods.....	11,864	1,403	87,253	54,834
Steel bars.....	48,895	7,885	466,877	455,431
Billets, ingots and blooms, n.e.s.....	19,032	678	242,585	80,694
Bolts and nuts.....	3,938	2,048	28,221	35,252
Hoops and bands.....	4,831	999	36,028	36,217
Horseshoes.....	35	73	1,975	1,461
Cut rails.....	147	12	3,446	3,407
Wire nails.....	6,445	767	50,020	71,052
All other nails, including tacks.....	81	255	6,904	9,276
Cast-iron pipes and fittings.....	4,754	4,790	36,561	68,307
Wrought pipes and fittings.....	23,887	36,101	177,966	373,136
Radiators and cast-iron house heating boilers.....	482	273	5,943	4,491
Railroad spikes.....	1,747	901	14,188	13,231
Steel rails.....	46,564	31,392	445,875	506,026
Galvanized sheets and plates.....	10,194	4,173	81,369	87,172
All other sheets and plates.....	1,567	1,550	27,795	23,188
Steel plates.....	76,248	29,007	585,561	734,722
Steel sheets.....	13,607	7,193	119,532	137,860
Ship plates punched and shaped.....	6,068	1,239	22,383	29,719
Structural iron and steel.....	36,904	19,831	272,528	490,498
Tin and tern plates.....	23,058	3,046	169,266	174,022
Barbed wire.....	14,034	971	100,280	84,242
All other wire.....	17,531	3,580	131,896	162,370
Total.....	395,120	162,592	3,401,127	3,974,754

gross tons, are the lowest recorded since January, 1914, when they declined to 118,768 gross tons. In May and June of the same year, they rose respectively to 139,110 and 143,953 gross tons, falling again in July to 114,790 and touching the low point in August with 86,598 gross tons.



slump both in volume and value, the latter having been only \$24,234,901, as against \$42,073,945 for March.

Ending with April, the 10 months, whose spread embraced a period of great activity both in the domestic and foreign markets, the exports of iron and steel totaled 3,974,754 tons, valued at \$956,619,444, while for the corresponding period of last year they aggregated 3,401,127 tons, valued at \$744,369,978. Imports for these respective periods were 219,874 tons, valued at \$38,579,033 and 369,062 tons, valued at \$28,440,381. So the relative position of exports and imports shows a reversal when compared with the 10-month period and with any single month since February, to the advantage of the latter.

There were a few items, however, which were exported in larger quantities in April of this year than for the same month of last year, but the gains were inconsiderable, except with regard to welded pipe. The



position of the latter probably is explained when it is recalled that in addition to the railroad strike, pipe mills one year ago had more domestic business than they could handle and rejected a big volume of foreign offers. The welded pipe exports for April of this year were 36,101 tons as against 23,887 tons for April of last year. Mexico continued to be the country to which greatest exportation was made, taking 9210 of the

2382 tons for April. The Dutch East Indies took 7352 tons for April and 51,764 tons for the ten months; China, 6622 and 33,643 tons, and Chile, 3746 and 10,426 tons.

Canada was the heaviest buyer of American-made

#### Exports, January, 1919, to April, 1921, Inclusive

	All Iron and Steel	Gross Tons Pig Iron	Semi-finished Material
January, 1919 .....	360,456	35,793	11,594
February .....	234,793	20,178	10,407
March .....	344,506	22,054	8,176
April .....	408,204	16,300	11,488
May .....	447,050	32,233	20,771
June .....	544,580	39,540	46,016
July .....	287,823	38,373	21,318
August .....	396,743	36,071	36,162
September .....	363,505	18,991	37,513
October .....	302,456	14,108	20,713
November .....	295,045	21,429	13,211
December .....	254,676	14,612	21,538
Total .....	4,239,837	309,682	259,907
January, 1920 .....	333,601	18,468	19,937
February .....	308,185	15,739	22,693
March .....	417,216	22,740	30,444
April .....	395,120	14,608	19,032
May .....	420,359	13,032	16,370
June .....	402,707	17,075	29,811
July .....	458,866	29,647	17,243
August .....	431,484	22,645	20,920
September .....	409,200	22,724	18,113
October .....	452,015	17,296	11,853
November .....	434,297	13,929	7,042
December .....	498,765	10,055	2,415
Total .....	4,961,851	217,958	216,873
January, 1921 .....	547,394	3,710	315
February .....	393,328	1,307	92
March .....	230,635	2,320	1,023
April .....	162,592	2,781	3

36,101 tons and for the 10-month period took 136,948 tons out of a total of 373,136 tons. Other countries to which welded pipe was shipped in April and for the 10-month period and the respective quantities were: Cuba, 827 and 18,258 tons; Japan, 489 and 22,514 tons; Dutch East Indies, 1851 and 21,915 tons; British India, 3034 and 31,505 tons; United Kingdom, 1404 and 13,668 tons; and Peru, 1145 and 13,655 tons.

Other products showing gains in exports in April, 1921, over April, 1920, and the respective tonnages were ferromanganese, 218 and 33 tons; nails, other than wire, including tacks, 255 and 81 tons; and cast pipe, 4790 and 4754 tons. Mexico also was the chief country to receive our exports of cast pipe, taking 2615 tons in April and 20,170 tons for the 10-month period. Cuba led as to steel rail importations from the United States for the 10-month period with 77,649 tons and

## TARIFF BILL DELAYED

### Entire Membership of Committee Will Be Consulted in Regard to Measure

WASHINGTON, May 31.—Republican members of the House have called a meeting for to-morrow to consider the Longworth joint resolution, which would give the Committee on Ways and Means discretionary power to make import duties carried in the permanent tariff bill effective from the date of its introduction.

It was decided by the Republican steering committee to place the question before the entire membership, because it was felt that the matter was too important to be determined solely by Republican members of the committee. It also is evident that another reason was to establish harmony, if possible, among Republican members of the House, so as to meet the vigorous opposition that undoubtedly will develop from the Democratic side. The resolution also will meet strong opposition in the Senate, according to all indications, not alone from the Democrats but also from some prominent Republicans.

#### Exports of Machinery

	April 1920	April 1921	For the Ten Months Ending April 1920	April 1921
Adding machines	\$ 472,563	\$ 224,007	\$ 3,184,007	\$ 5,533,681
Air compressing machinery	512,765	306,274	3,410,283	5,177,558
Brewers' machinery	31,906	1,587	263,494	400,420
Cash registers	628,686	235,641	4,429,756	3,470,454
Parts of	31,611	37,890	280,130	342,028
Concrete mixers	70,802	43,332	386,270	957,808
Cotton gins	51,187	6,547	207,020	265,322
Cream separators	93,646	38,379	900,438	609,596
Elevators and elevator machinery	165,253	167,685	1,632,202	1,779,477
Electric locomotives	100,419	31,499	972,572	298,471
Gas engines, stationary	53,491	22,687	643,440	560,576
Gasoline engines	3,943,469	570,171	26,163,292	22,318,583
Kerosene engines	762,607	302,650	7,677,940	8,544,857
Steam engines	4,641,344	2,306,690	34,952,500	43,268,507
All other engines	309,588	174,929	2,251,043	3,554,915
Boilers	491,246	384,068	5,434,755	8,447,937
Boiler tubes	405,022	292,528	3,596,219	6,293,741
All other parts of engines	1,653,947	1,083,409	18,188,237	28,883,848
Excavating machinery	67,091	275,617	1,187,292	2,283,673
Milling machinery, flour and grist	311,539	122,605	1,376,581	1,932,467
Laundry machinery, power	118,220	116,665	901,702	1,003,466
All other	57,385	23,022	388,490	794,268
Lawn mowers	31,662	37,338	300,278	824,954
Lathes	560,008	335,614	7,239,502	4,974,715
Other machine tools	1,239,819	370,320	10,504,906	9,538,835
Sharpening and grinding machines	334,260	84,946	3,700,018	2,433,516
All other metal working machinery	1,489,635	1,255,542	19,736,012	14,728,870
Meters, gas and water	69,851	75,487	505,015	686,220
Mining machinery, oil well	363,404	911,630	3,271,799	9,733,364
All other	600,170	617,777	7,335,551	8,453,577
Paper-mill machinery	206,024	232,671	2,356,276	3,295,684
Printing presses	549,697	826,923	4,776,935	9,400,495
Pumps and pumping machinery	1,098,020	1,356,725	8,332,125	15,232,928
Refrigerating and ice-making machinery	326,828	197,204	1,922,633	3,216,282
Road-making machinery	98,657	111,741	868,821	990,741
Sewing machines	1,508,421	564,773	11,770,427	10,164,499
Shoe machinery	113,562	146,674	2,211,751	2,602,436
Sugar-mill machinery	1,499,532	1,308,043	13,535,698	26,586,071
Textile machinery	1,438,432	1,475,159	5,224,119	21,081,015
Typesetting machines	325,622	308,957	308,957	4,105,966
Typewriting machines	2,391,307	727,374	17,115,123	17,286,524
Windmills	166,604	143,514	1,095,643	2,566,451
Wood-working machinery, saw mill	145,117	107,364	783,909	1,247,383
All other	181,236	170,818	2,752,855	3,531,571
All other machinery and parts of	7,490,151	6,282,425	63,643,795	59,824,018
Totals	\$37,251,904	\$24,234,901	\$307,672,032	\$399,118,036

plates for the 10 months, taking 170,844 tons, while for April that country took 4743 tons. The United Kingdom ranked second, taking 137,124 tons and 7501 tons respectively and Japan third, with 77,211 and 6423 tons.

The only items of machinery whose exports in April, 1921, shared appreciable gains over April of last year were oil well machinery, printing presses and shoe and textile machinery.

Still further delay has been encountered in introducing the tariff bill, and predictions as to the time it will be reported to the House have been made so frequently by members of the Ways and Means Committee, only to prove incorrect, that they now hesitate to say when they expect it will be introduced. They are hoping, however, that it can be introduced by June 15. The schedules framed by the sub-committees still are being studied, but the metal schedule has been given final consideration by the full committee, it is said, and it is stated that recommendations as to rates, reclassification, etc., made by the sub-committee in charge, headed by Representative Tilson, were accepted practically entirely.

The research information service of the National Research Council announces it is prepared to assist investigators by locating scientific publications which are not generally or readily accessible. It will also, as is desired, have manuscripts, printed matter or illustrations copied by photostat or typewriter. The cost of copying varies from 10 to 25 cents per page. Requests for assistance should be addressed to 1701 Massachusetts Avenue, Washington.

## COMMON CARRIERS

### Decision of Interstate Commerce Commission as to Several Steel Corporation Roads

WASHINGTON, May 31.—The Benwood & Wheeling Connecting and the McKeesport Connecting railroads, subsidiaries of the National Tube Co., are common carriers with certain limitations, while the Mercer Valley railroad, a subsidiary of the Union Steel Co., is not a common carrier, according to a decision of the Interstate Commerce Commission handed down last Wednesday. The two National Tube Co. roads are given the status of a common carrier subject to limitations in their dealings with trunk lines due to the fact that their stock is held by a subsidiary of the United States Steel Corporation, and their principal work is that of carrying tonnage of the proprietary interests.

The report covers a number of important complaints by four subsidiary steel companies of the Steel Corporation. The complainants, served by the three industrial roads, asked reparation for demurrage charges assessed by and paid to connecting trunk lines on cars of inbound and outbound interstate traffic which moved from July 29, 1916, to Dec. 28, 1917. The complainants were the National Tube Co., with plants at Benwood, W. Va., and McKeesport, Pa., served respectively by the Benwood & Wheeling Connecting railroad, and the McKeesport Connecting railroad; the American Sheet & Tin Plate Co., with a plant at McKeesport, served by the McKeesport road; the American Steel & Wire Co. and the Carnegie Steel Co., with plants at Farrell, Pa., served by the Mercer Valley railroad. The decision said no order awarding reparation would be entered at this time.

The majority opinion was written by Commissioner Hall. Commissioners McChord and Eastman dissented from the holding that the Benwood & Wheeling is a common carrier, and set forth their views. The sub-

stance of them is expressed by Commissioner McChord in a separate report to the effect that 99.72 per cent of the tonnage hauled by this road is that of the proprietary interest.

The attitude of the majority members of the commission is that the McKeesport and Benwood & Wheeling industrial lines not only hold themselves out as common carriers, but have facilities which are available for use in connection with their service for the public and are used in such service to a limited but appreciable extent. In the case of the Mercer Valley it is stated that it "obviously is intended to serve the affiliated industries which it does serve, and those only, and has no facilities which are accessible to or available for service to the general public."

The McKeesport, the Benwood & Wheeling and the defendant trunk lines, says the report, in fixing arrangements with respect to the detention of cars on the lines formed and the demurrage charges thereon, shall establish given rules to afford a proper basis for the adjustment of the demurrage charges on past shipments which were in controversy. These rules are to be in accordance with provisions adopted by the United States Railroad Administration, providing for assessment of charges for use and detention of cars except those at home on the tracks of the McKeesport road and the Benwood & Wheeling or the industries located on them, against the McKeesport road and the Benwood & Wheeling at the contemporaneous demurrage rates on cars delivered loaded and returned empty after the expiration of 72 hours' free time; for the similar assessment of charges for use and detention of cars at the contemporaneous demurrage rates on cars delivered loaded and returned after 144 hours' free time; and for the like assessment of charges for use and detention of cars on cars delivered empty and returned empty after 24 hours' free time. At some length the opinion arranges details for calculating allowances, time of placement of cars, etc.

### Late Developments in the Basset Direct Steel Process

The latest developments in the Basset direct process for steel in France are recounted by the French correspondent of the *London Ironmonger*, in its issue for May 7, as follows:

The experimental stage in Lucien Basset's process for the production of iron, steel and pig iron direct from ore in the rotary furnace is said to be now completed, and the inventor states that a plant consisting of twelve 250-ton furnaces, on the edge of the iron mines of Normandy, capable of producing 3,000 tons of metal per day, will begin to be constructed in the course of a month. The cost of production, it is claimed, will be only 110fr. per ton, a figure which seems incredible in view of the fact that ore alone to-day is between 20fr. and 30fr. per ton, and the cheapest coal obtainable from 90fr. to 100fr. per ton. M. Basset also states that each furnace will cost only 2,500,000fr. to erect, compared with the 42,000,000fr. required for the erection of blast furnaces or an open-hearth plant of like capacity. The erection of the plant, he says, has been decided upon after the success obtained recently at Dennemont, near Mantes, first with 25-ton and then with 100-ton furnaces, in which rail-quality steel has been successfully produced. M. Basset's unwillingness to permit inspection of his plant throughout his experiments has, not unnaturally, created a good deal of skepticism on the Continent, and the claims made for his process are not yet taken very seriously by steelmakers. Should his promises be fulfilled and steel be placed on the market at a price which is even less than that ruling in pre-war days, and at only a quarter of the present quotation, a revolution will indeed be brought about in metallurgy.

### Ferromanganese Being Made in India

Ferromanganese has been made in considerable quantities at the works of the Bengal Iron Co., India, with a guaranteed minimum of 70 per cent of manganese and phosphorus contents not greater than 0.55 per cent, according to the *London Iron and Coal Trades Review*. A small quantity of this is used locally and the balance is exported. For the fiscal year ended March 31, 1920, the exports of ferromanganese from India amounted to 506 tons—a very considerable decrease from the previous year, when 10,878 tons were

sent abroad. For the two months ended May 31, 1920, the exports amounted to 3023 tons, of which the greater portion was shipped during May. Ferromanganese is also made at Jamshedpur, by the Tata company. One authority states that, owing to limitations in the quality of the coke and the high percentage of phosphorus in Indian manganese ores, which seems to increase with depth, it is not likely that the country will ever be a large producer of ferromanganese with a low percentage of phosphorus by the blast furnace method as at present practised.

### Hoosier Rolling Mill Co. Additions

The Hoosier Rolling Mill Co., Terre Haute, Ind., has practically completed mill additions at Steelton, a suburb. A spring plant, to be devoted to the manufacture of automobile and truck springs, is expected to commence operations in the near future, and a plant containing a 20-in. mill will be ready for operation in about a month. The spring plant is 80 x 400 ft., while the new mill structure is 100 x 400 ft. The 20-in. mill will be supplemented by 8 and 12-in. mills now under construction.

Herman Schneider, dean of the College of Engineering and Commerce at the University of Cincinnati, delivered an address before the Engineers' Club of that city on May 19 on the seven limiting factors of production. N. R. Whalen, professor of finance of the College of Engineering, also spoke on the first limiting factor, capital, and called attention to the enormous amount of capital, which he described as not only money but equipment, which had been destroyed during the war and which must be restored before production could be increased.

Owing to depressed conditions in the steel industry and the low price at which pig iron can be bought in the open market, the new 600-ton blast furnace which was built for the Trumbull Steel Co. at Warren, Ohio, by the Trumbull-Cliffs Furnace Co. will not be operated for some time. The stack is rapidly nearing completion and contains all modern auxiliary equipment.



# A Radical Change in Open-Hearth Practice

Making a Blow Torch of the Ports in the Egler Furnace at Brier Hill Steel Co.'s Plant—Increased Efficiency the Result

BY GEORGE L. PRENTISS\*

AT one of the recent meetings of the American Iron and Steel Institute, when open-hearth practice in the United States was thoroughly discussed, it was admitted that furnace efficiency was altogether too low. The first duty of the open-hearth superintendent has been to make steel and to come as near as possible to satisfying apparently insatiable demands.

In the Pittsburgh region there has been plenty of natural gas and ideal fuel. Records were hung up long ago which it has been hard work to surpass. But efficiency received scarcely a thought. Now, with the fuel costs, labor costs and all other costs high and likely to remain so, it is natural that the steel industry should turn toward increased efficiency with a fixed determination to find it.

There seem to be two main elements in open-hearth practice, the improvement of which make for increased efficiency. These are furnace design and apparatus for combustion.

Up to the present time there has been little radical change, in design at least, in the stationary furnace. This is necessarily a conservative, careful piece of work for, as everybody knows, small changes bring great differences in results. Still we must admit that present furnaces are greatly improved in design over what was thought first-class work a dozen years ago.

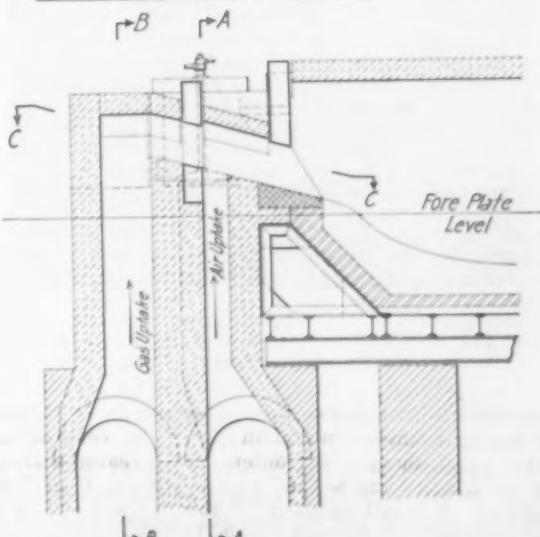
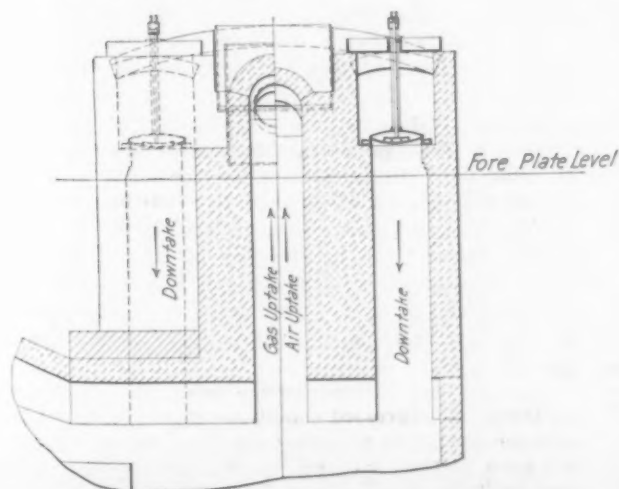
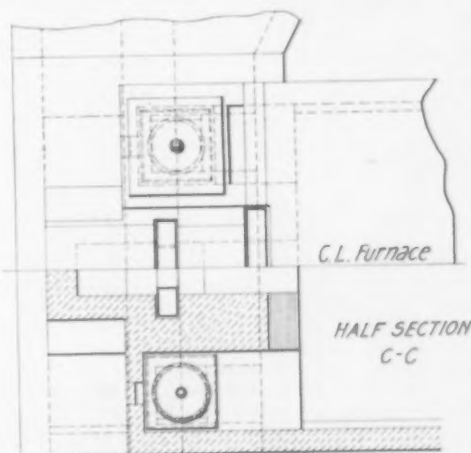
In the combustion field, so far as affects open-hearth furnaces, progress has also been slow. The general plan seemed to be susceptible of but little change, no matter what fuel was used. Whether producer gas, liquid fuel, powdered coal or coke-oven gas, the arrangement for burning the fuel on the hearth has always been planned on the basis of natural or stack draft. This has necessarily involved a theory of combustion which can readily be compared to the operation of the Bunsen burner.

The air and gas are kept separate up to a point where ignition and combustion are to take place, the elements are proportioned so that there is a due excess of air in accordance with a formula traditional and

well nigh sacred. So the area, length, diameter and materials of the fuel ports, uptakes, blocks, etc., have been carefully studied and great pains have been taken to see that these features, when once determined, are kept as nearly as possible in their designed proportion and arrangement.

It was Nicholas F. Egler who first saw the advantages of making the flame for the open-hearth furnace a *blow torch* rather than a *Bunsen burner*. After considerable experimental work, he applied for his first patent on this subject in March, 1919. The boldness of his conception as an inventor brought about the usual delays in the patent office and his patent was finally granted in March of this year. The Egler inventions and patents are assigned to and are the property of the Blair Engineering Co.

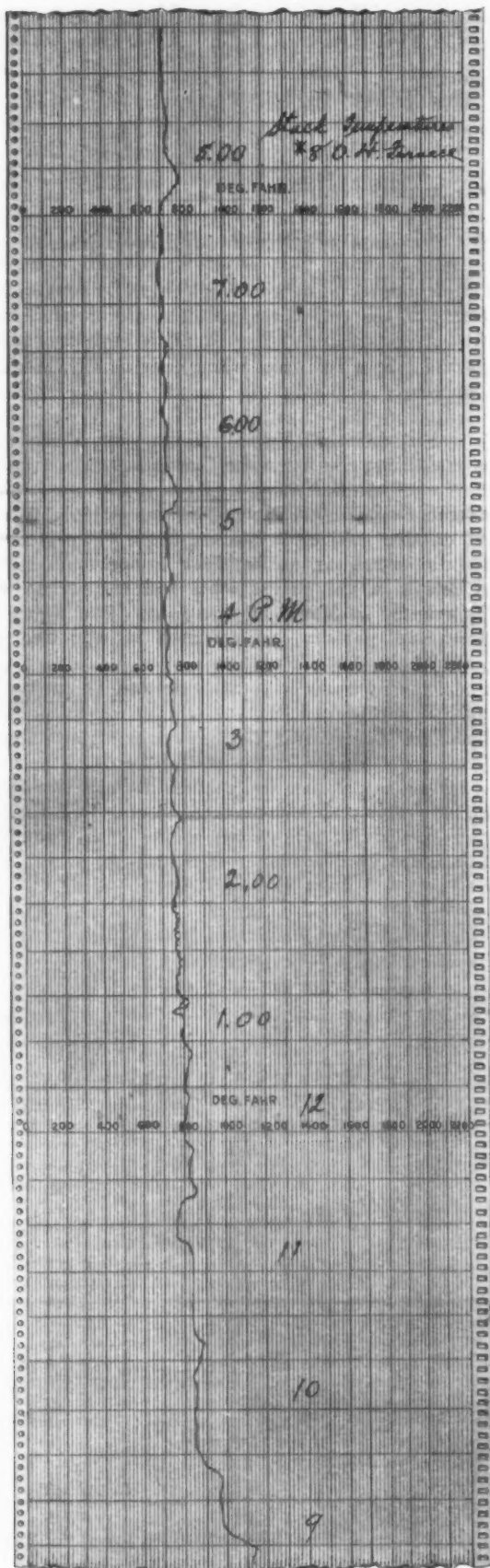
The first furnaces have been erected and installed at the plant of Brier Hill Steel Co., Youngstown, Ohio, by the Blair Engineering Co. under the Egler patents, and are now operating there with remarkable success. In order to accomplish the results desired, according to the blow-pipe theory, it is necessary that all the gas and air needed for combustion should pass through a port designed as a combined fuel and air port. This



HALF SECTION B-B HALF SECTION A-A

Typical Port Arrangement for Producer Gas in Egler Open-Hearth Furnace

\*Blair Engineering Co., New York.



Reproduction of Temperature Chart of Stack Conditions on an Egler Furnace at Brier Hill Steel Co.'s Plant

also requires in practice positive pressure on both air and gas.

In producer-fired furnace practice at Brier Hill, the air is put into the checker chamber by fan pressure, the gas is fed to the gas regenerator at the natural producer pressure, which happens to be just right. The gas comes up under the port hood at the end farthest from the hearth and is turned and di-

rected downward toward it in the usual way. At the proper point in its flow toward the hearth the gas meets a stream of air fed vertically upward and across the stream of gas. The air flows all around the gas, below it as well as above it. This stratum of air below the gas is of peculiar advantage in practice.

As soon as the gas and air meet, intense combustion immediately takes place. But such is the speed of the mingled gas and air (partly by pressure given to them but still more by the expansion due to combustion) that the temperature within the port itself is not found to be unduly high. The ends farthest from the hearth, which might have been expected to suffer by heat radiated into the pocket formed by the abrupt angle at the top of the uptake, have stood up splendidly so far and seem quite likely to last out the full campaign.

The torch of air and gas rushes from the port nozzle in a perfectly mixed flame and the air on the under side of the gas appears to make the flame duck down and hug the surface of the bath in the most satisfactory way. Combustion is entirely accomplished by the time the middle door of the furnace is passed and the atmosphere of gas at the outgoing end of the hearth is as clear as the proverbial bell.

The roof is bathed in a slow-moving body of air, the surplus over that needed for combustion. This air moves slowly because there is no great excess of air and because it is unable to reach the roof except by detachment from the stream of flaming gas and by the expansion incident to the heat of the furnace itself. The roofs seem to be in as good condition if not better than normal. The practice at Brier Hill seems to dispose of the theory heretofore held that excess air must be supplied in considerable volume to take care of the roof and walls. Until Egler's furnace was built, nobody has ventured to eliminate this feature.

At each end of the furnace are two flues auxiliary to the main gas and air supply. These flues at the upper or furnace end of their uptakes are fitted with water-cooled mushroom valves on water-cooled seats. At the end where the gas is entering, these valves are tightly closed and the flues they cover (which are filled with air from the air regenerators) cannot discharge any air into the furnace. All must pass through the combined fuel and air port.

At the discharge end of the furnace these auxiliary valves are wide open and the valves themselves are drawn up into pockets provided in the furnace roof. The auxiliary flues thus uncovered permit the gases of combustion, now greatly expanded, to flow from the furnace to the regenerators. There are thus four outlet flues in use, two under the hood of the outlet port (one to gas checkers and one to air) and the two auxiliary flues which are both connected to the air regenerators.

The furnace is, of course, reversed from time to time in the usual manner. The mushroom valves are simultaneously also reversed. No interruption or slackening of furnace heat is noticed on reversal. A noteworthy feature about these mushroom valves is the ease with which the valves and seats can be cleaned through an inspection door in the side wall directly opposite each valve. Observation of actual practice shows that the cleaning off of a valve seat takes only a couple of minutes and may be done with a short-handled tool. The seats are customarily cleaned off once or twice a day, so the valves remain entirely tight.

Observations in the checker chambers show that, while they are quite hot enough, they are in nowise overheated, notwithstanding the heat on the hearth. It may be stated that the hearth temperature is the highest ever systematically maintained. Observers agree that they have never seen anything like it. But the combustion is so perfect and the heat transmitted



to the bath so greatly in advance of previous practice, that the checkers stand at about 2000 deg. Fahr. all the time, inlet gas is about 1500 deg. Fahr. and the stack temperatures run constantly from 700 to 800 deg. Fahr., as shown by a reproduction of an actual chart.

The waste heat boiler is thus a superfluity, and probably no steel man will lament its passage to the limbo of forgotten things. Stack draft is necessarily low with such low stack temperatures.

These remarkable conditions of combustion are reflected not only in the economy of the furnace, but in its capacity as well. Records are too new to be given out as yet but they will be eagerly awaited when a representative campaign has been run.

The Egler furnace is equally well adapted to all kinds of gas or liquid fuel and to powdered coal. Other furnaces at Brier Hill will afford the opportunity to judge of the performance with natural gas and with coke-oven gas (with and without tar) and on liquid fuel alone.

The installation for coke-oven gas and for natural gas differs from that above described on producer gas, in the following particulars: There is only one set of regenerators, the air uptake is farthest from the hearth instead of nearest (as with producer gas), the gas is admitted at a point between the air uptake and the port outlet to the furnace, by the customary pipes, one on each side of the combined fuel and air port, and the supply pipe outlets are so located and directed as to insure the most complete mixture of gas and air. Otherwise the furnace installations are the same; the mushroom valve arrangements are identical and the whole theory of combustion is, as above described, strictly adhered to.

For liquid fuel the installation is similar to that for coke-oven gas. The oil or tar is admitted through the end wall beneath the hood of the port, which thus becomes a perfect retort, giving the liquid to the hearth in a state of complete gasification.

The use of coke-oven gas in combination with oil or tar is provided for in this manner by the most simple and easily operated construction, equally efficient with either or both types of fuel.

For powdered coal, the installation is also similar to that for coke-oven gas, except that the application of the coal fuel to the retort formed by the combined fuel and air port is dependent upon the type of powdered coal supply with which the steel plant may be provided. Where powdered coal is the indicated fuel but has not been installed previous to the equipment with the Egler furnace, the arrangements for combustion are extremely simple. The retort is used also as

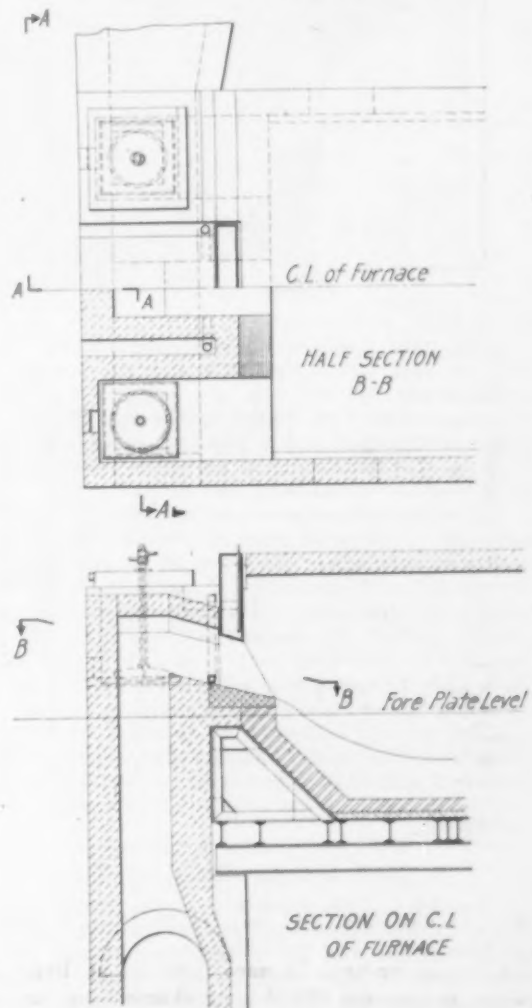
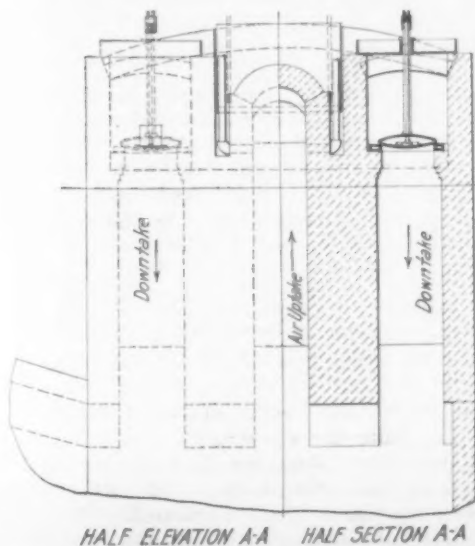
a diffusion chamber and especially constructed for that purpose. It is expected that further data on this subject will be available to the industry at no distant date.

It seems evident that phenomenal increase in capacity and economy by the use of the Egler invention are assured and also that open-hearth furnace construction costs are likely to be considerably reduced by its installation. It is already evident that brick materials can be used of cheaper grades than at present in several important parts of the furnace installation. This also is a subject which the future practice must confirm before positive statements can be made.

The illustrations clearly show the essential features of the Egler furnace. It is obvious that for special conditions a considerable variation in the details of the installation can be easily made.

The Cincinnati Terminal Warehouse Co., Cincinnati, has revived the project of the construction of warehouse facilities, which were held up as a result of the war. The company contemplates the erection of a fire-proof reinforced concrete building, 650 x 171 ft., seven stories, on Front Street, extending from Central Avenue to Smith Street, to have 550,000 cu. ft. of storage capacity and 1,000,000 cu. ft. of cold storage capacity. Many of the leading business men of the city are among the directors of the company.

The Inland Steel Co., Chicago, has purchased 580 acres in Porter County, Ind., adjacent to 256 acres previously purchased on Lake Michigan. The tract of land lies just east of the Indiana Steel Co. plant at Gary. The Inland Steel Co. has no immediate plans for the improvement of this property.



Typical Port Arrangement for Coke-Oven Gas, Natural Gas, Tar, Oil and Powdered Coal in Egler Open-Hearth Furnace

## Autopart Regrinding Machines

The Norton Co., Worcester, Mass., has placed on the market a special type of grinder designed for automobile regrinding shops and adaptable alike to the regrinding of crankshafts and the grinding of pistons, piston pins, valves, etc. It is claimed that the machine will handle all the cylindrical grinding necessary to put a gasoline engine into first class condition and that this machine together with a cylinder grinder constitutes all the grinding equipment necessary for a shop doing automobile regrinding work.

The swing of the machine is 18 in., and the distance between centers 55 in. Twelve work speeds are provided. The wheel slide is of massive design, weighing about 900 lb., and is equipped with a 26-in. diameter grinding wheel so that ample clearance will be provided when grinding crankshafts for long stroke motors. The headstock and footstock are of standard Norton type except that they are somewhat heavier and have longer bearing surfaces on the table. A pump is supplied and is driven directly from the overhead works.

The Norton standard wheel feed mechanism is used

though various changes in the footnotes, asked by the men, would provide increases in compensation for the lower priced workmen, if granted.

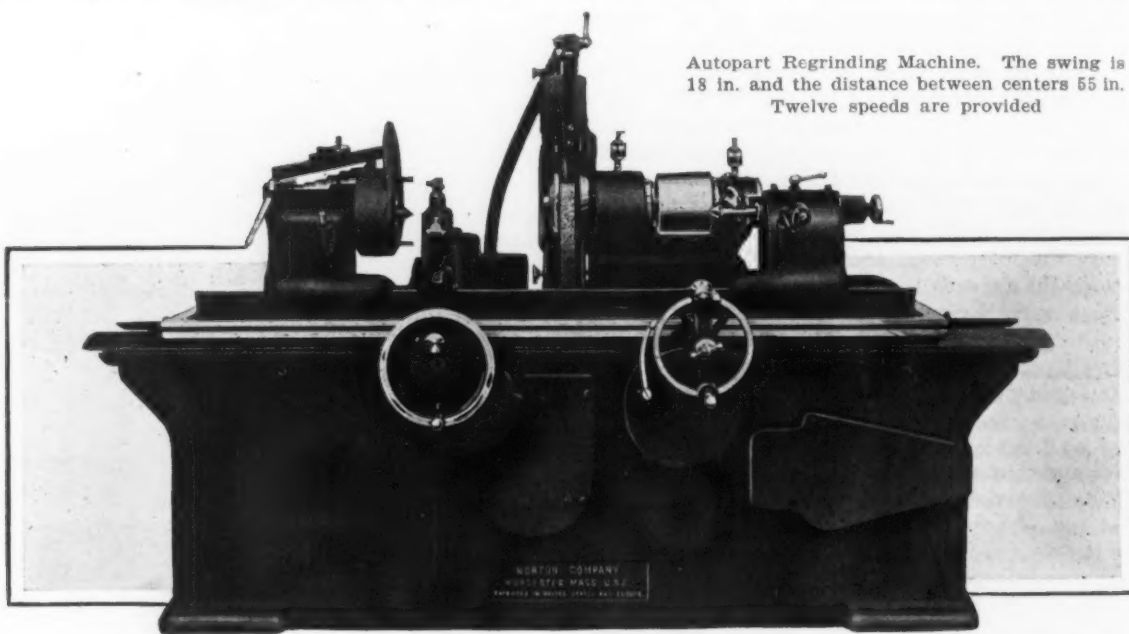
An important change in the agreement with boilers is embodied in the footnote which reads "that when 30 per cent or more Bessemer or 30 per cent or more charcoal or iron of similar analysis is worked alone or mixed, \$1 per ton extra shall be paid." This change, it is stated, would mean an increase of 50c. per ton in puddling the higher grades of iron.

Another footnote which provides an increase of 25 per cent for the second catcher on the third classification of the sheet scale virtually eliminates the difference in classification. Another note provides for a helper for the rougher on a sheet mill and another asks for a 15 per cent increase for tin mill roughers.

## Detroit and Cleveland Companies May Be Merged

Plans are under way for the merger of the Detroit Pressed Steel Co., Detroit, with the Hydraulic Steel Co., Cleveland. The latter company has taken an op-

Autopart Regrinding Machine. The swing is 18 in. and the distance between centers 55 in. Twelve speeds are provided



consisting of a 3½-in. diameter feed screw engaging with a half nut underneath the wheel slide which rests on one flat and one feed way. The precision of the machine may be judged by the fact that the movement of the feed index pin one space advances the slide ⅓ of a thousandth of an inch. The table is operated by a two-speed hand feed apron.

An adjustable end-block is furnished to facilitate the handling of different types of crankshafts. With these blocks no bushings or other devices are required for fastening different diameters of shafts in the fixture. A combined center and valve face grinding attachment is also part of the regular equipment and by its use machine centers may be reground and kept in condition. The attachment is adjustable, permitting the regrinding of the faces of all types of valves.

The specifications give the range of work speeds as from 20 to 207 r.p.m.; length of bearing ways 24½ in.; length of spindle 28¼ in.; large bearing 3½ x 8 in., and small bearing 2 x 6 in. The net weight of the machine is 7600 lb.

## Will Ask for Six-Hour Turn

At the annual conference with manufacturers in June, at Atlantic City, the Amalgamated Association of Iron, Steel and Tin Workers will again ask for a 6-hr. turn for sheet and tin mill workers in the new wage agreement. This request was presented during the negotiations last year, but was withdrawn by the Amalgamated with little discussion.

Base scales in all branches, both steel and iron, are indorsed by the Amalgamated for the ensuing year,

tion on the common stock and series A common stock of the Detroit company until July 1 and a meeting of the stockholders will be held June 24 to vote on the consolidation and the authorization of a second preferred stock issue. An exchange of three shares of the common stock of the Hydraulic company for four shares of the common stock of the Detroit company is proposed. This will require the issuance of 54,300 shares of Hydraulic common stock, and \$850,000 of second preferred stock which would be exchanged for 50,000 shares of Series A common stock of the Detroit company, having a par value of \$1,250,000. Stockholders of the Hydraulic company will be asked to approve \$2,750,000 increase of the capital stock, this increase to be in second preferred stock. Although the amount needed to take over the series A stock of the Detroit company is only \$850,000 an additional amount of \$1,900,000 is desired for use in acquiring the preferred stock of the Detroit company and to acquire other property that the Hydraulic company may take over. According to the announcement of President James H. Foster of the Hydraulic company, the Detroit Pressed Steel Co. consumes 30,000 to 40,000 tons of steel a year and the acquisition of the Detroit plant would provide a market for the surplus steel of the Canton, Ohio, sheet mill plant of the Hydraulic company.

The Cleveland Engineering Society, Cleveland, will make a trip to Dayton, Ohio, June 7 and will spend the day visiting the plants of the Dayton-Wright Airplane Co., the National Cash Register Co., the laboratory of the General Motors Corporation and other plants.



# Mechanical Engineers Meet at Chicago

Spring Convention Largely Attended — Power  
Test Codes Adopted — Sessions on Trans-  
portation, Management, Materials Handling

THE American Society of Mechanical Engineers held its spring meeting at the Congress Hotel, Chicago, on May 23 to 26 inclusive. The final registration figures showed a total attendance of 1235, which constitutes a record for a spring convention. It was learned at the meeting that the membership of the society has passed 14,000. Among the various sectional meetings held were sessions on management, railroads, materials handling in highway construction, forest products and power resources in the Middle West. The discussions brought out in the sessions on fuel and on machine tools, as affected by the automobile industry, were reported by telegraph in *THE IRON AGE* of May 26. The nominees for officers of the society for the coming year, as selected by the nominating committee, were also announced in that issue of this publication.

One of the important actions of the convention was the adoption of two power test codes, one covering general instructions which was accepted by the society with slight verbal corrections to be made by individual committee No. 1 in conjunction with the main committee of the society, and the other on the subject of reciprocating steam engines, which was likewise accepted substantially as submitted. A third code on evaporating apparatus was recommitted to the individual committee for revision with instructions that conferences be held with a similar committee of the American Institute of Chemical Engineers. The individual committee on turbines held an extended session at the convention and practically completed a draft of its test code, which it expects to submit to the main committee next October.

## Waste in Industry Discussed and Made a Subject of Annual Meeting

THE relationship of the mechanical engineer to the elimination of waste in industry will be the major topic of the forthcoming annual convention of the society. A detailed program will be developed from the findings of the committee on the elimination of waste in industry of the American Engineering Council, which were scheduled to be made public about June 1, and on the report of the super-power survey of the U. S. Geological Survey. The management division of the society will prepare the program and conduct the keynote session for the convention.

In the report of the executive committee of the management division a definition of management is presented as follows:

Management is the art and science of preparing, organizing and directing human effort applied to control the forces and to utilize the materials of nature for the benefit of man.

An interpretation of this definition is given in the following statement:

Inasmuch as the problems of management are of the utmost complexity and difficulty, the management division of the American Society of Mechanical Engineers in seeking to render disinterested service, therefore declares its purpose to be the formulation and declaration of the fundamentals of management, both regulative principles and accepted practice, and the dissemination of management knowledge.

In working toward this object, the management division can thus not only be of service to the other professional divisions of the society, to the individual members of the society and to all other societies of like aim, but also to all who are in responsible charge of human effort, and therefore through them of benefit to society at large.

In carrying out such a broad purpose the activities of the management division will vary with changing need, states the report. A few activities already in project are suggested: The standardization of management terminology, units of measurement, methods of measurement, and methods of expression; the improvement and development of management education; the elimination of management wastes in industry; the elimination of unnecessary fatigue in industry and engineering and, lastly, management research.

Two co-operative activities have been entered into by the executive committee with other societies. The first is through a committee of representatives from six organizations appointed to study and report upon management terminology. The other organizations participating are the Industrial Relations Association of America, the National Association of Cost Account-

ants, the Society of Industrial Engineers, the American Institute of Accountants and the Taylor Society. Within a month a second co-operative activity has been initiated through the establishing of a joint committee on graphics. Three other organizations are participating in this study: the Society of Industrial Engineers, the Taylor Society and the American Statistical Association.

A progress report on symbols in heat engineering was submitted during the convention by the standing committee on technical nomenclature.

### Waste Elimination Possibilities

In the management session of the meeting L. W. Wallace, executive manager of the American Engineering Council of the Federated American Engineering Societies, indicated some of the problems which have been considered in the investigation of industrial waste which has been conducted by a special committee of the council, appointed by Herbert Hoover. In great centers like Chicago and New York, elevators have been found a prolific source of waste. Several million passengers are handled daily by elevators in Chicago and yet the architect, the engineer and the contractor do not build the office structure around the transportation medium, which is a very important factor, but the transportation medium is placed wherever convenient and it has often happened that the building has been under way before the elevator was even thought of. The economic loss through designing, constructing, installing and operating elevators under such a system is large.

A prominent locomotive company, he stated, was able to build 163 standard designed locomotives in five weeks, while it was able to produce only 104 locomotives of railroad design in the same period. A loss of production due to lack of standardization—this element of waste is occurring in every industry.

### Highway Problems Discussed

A Chicago session was held on Wednesday morning which was devoted to a discussion of the problems of the city as a mid-interior center, its terminal capacity and development and ways of co-ordinating the different media of transportation—the steam railroads, vessels, motor trucks, etc. The meeting was held jointly with the Western Society of Engineers and F. K. Copeland of that organization presided. J. R. Bibbins, the Arnold Co. engineer, Chicago, contended

that Chicago holds the potential place of a water gate as well as a rail head. The Chicago gateway, he said, may be expected to function as (1) the principal east-west divisional transfer point between east and west railroads and (2) the water gate for the interior via the Great Lakes route.

Highway transportation, particularly as it concerns road building, was given attention at the convention. To avoid waste and inefficiency in spending a billion dollars of the people's money during the next year, a materials handling division of the society announced its aim as being to "guard the highways, the most important of the transportation avenues of the country." R. M. Gates of Philadelphia is chairman of this division. In this connection, Charles F. Rand, New York, president Engineering Foundation, announced that the foundation will co-operate with the engineering division of the National Research Council in directing highway research on a national scale so that the huge expenditures by the States may not be wasted. Mr. Rand also asserted that research in all basic industries will be encouraged, as America cannot reap the full benefit of the experience of the war unless it excels Germany and other European nations in research activity. University laboratories will be utilized in common with those of great industries, such as the General Electric Co. and the DuPont Works, which have been pioneers in American research. Experiments in ascertaining the fatigue of metals have thus far shown encouraging results, he said. A fund of \$5,000,000, now being raised, will be used to promote research plans.

#### Oxy-Acetylene Welding and Cutting

Among the technical papers presented at the convention was one giving the results of an investigation of oxy-acetylene welding and cutting blowpipes, written by R. S. Johnston, engineer-physicist, United States Bureau of Standards, Washington. This investigation was first begun during the war when the increased use of oxy-acetylene welding and cutting equipment necessitated large purchases by the Government. In discussions concerning the relative merits of procurable apparatus it became evident that no authentic data were available as to the relative merits of the various blowpipes. The emergency of the investigation limited its proposed scope, but the signing of the armistice relieved the urgency and a much more complete series of tests was undertaken. In deciding on the final tests S. W. Miller, member American Society of Mechanical Engineers, was engaged as consulting engineer. After securing his suggestions the tests were submitted to the War Department for final suggestions before being submitted to the manufacturers of the apparatus to be tested. The tests occupied about three months. In brief, the author states, the results of the investigation would seem to warrant the following statements:

##### FOR THE CUTTING BLOWPIPES:

- a. That there is to-day no generally accepted theory for proportioning, for the cutting of metal of various thicknesses, the volume and velocity of the issuing cutting jet, with the result that none of the apparatus submitted to test proved economical for all thicknesses.
- b. That there is for any thickness of metal cut a limiting velocity of exit of the cutting jet at which complete utilization of the oxygen takes place and a limiting value for the amount of oxygen required to produce a cut.
- c. That an increase in acetylene consumption, of oxygen consumption, or of the velocity of exit of the cutting jet beyond the limiting values, does not produce increased efficiency in commensurate ratio.
- d. That a large majority of the blowpipes tested were equipped with excessive preheating flames for the thickness of metal the tip is specified for, and that such excessive-sized flames are disadvantageous both from the standpoint of economy of operation and quality of work performed.
- e. That considerable improvement in economy of operation seems possible in cutting material of two-inch thickness and that possibly this condition may be found to exist for metal of other thicknesses than those used in the tests.
- f. That the maximum thickness of metal that may be economically cut with an oxy-acetylene blowpipe of standard design when neither the material nor the oxygen is preheated and the cutting is done only from one direction, is about 12 in.
- g. That cutting blowpipes due to their incorrect design

are subject to the same "flashback" troubles found in the welding blowpipes.

##### FOR THE WELDING BLOWPIPES:

- a. That the blowpipes most subject to the so-called phenomena of flashback are those in which the oxygen is delivered at a pressure in excess of that at which the acetylene is delivered.
- b. That all the blowpipes tested, including those in which the acetylene is delivered at an excess pressure as well as the so-called equal- or balanced-pressure blowpipes, are subject to flashback phenomena on account of inherent defects in their design.
- c. That the cause of the development of the conditions producing flashback is the setting up within the blowpipe tip and head of a back pressure which retards or chokes off the flow of one of the gases.
- d. That this back pressure is the result of confining or restricting the volume flow of the issuing gases at the tip end.
- e. That any cause tending to restrict the flow of the gases sets up a back pressure which immediately causes a change in the amount of each gas delivered to the mixing chamber.
- f. That a fluctuating gas-volume ratio, due to restriction of volume flow, from whatever cause, prevents a blowpipe from maintaining constantly and at all times during operation the desired "neutral flame."
- g. That a blowpipe that cannot maintain under all operating conditions a neutral flame cannot logically be expected to produce sound welds.
- h. That all the blowpipes tested during this investigation either through improper gas pressures or improper interior design or both are incapable of maintaining a neutral flame (constant-volume gas ratio) under all conditions of restricted gas flow and are therefore incapable of producing sound welds where there is any liability of the gaseous products of combustion being momentarily confined, such as occurs in practically all welding operations.
- i. That the ability of a blowpipe to consume an equal volume ratio of gases when burning freely and undisturbed in air is no criterion that it is capable of producing sound welds, i.e., that it is not subject to detrimental fluctuations in gas ratio during a welding operation and therefore is capable of maintaining a neutral flame under all operating conditions.
- j. That whether a blowpipe of present designs will consume an equal volume ratio of gases when burning freely and undisturbed in air depends on how nearly correct the operator sets the so-called "neutral" flame, and experience indicates that the average operator checks the acetylene gas flow too much and actually develops an oxidizing rather than a neutral flame.
- k. That the question of the possible limiting strength and ductility or the efficiency of welds made by the oxy-acetylene welding blowpipe must await the development of a more satisfactory instrument, and that having such an instrument there is no reason to believe that a weld of clean, sound metal cannot be made with assurance during any welding operation and that such welds will or can be made to possess the proper physical properties.

#### Plant Excursions

Plant excursions taken during the convention included visits to South Works of the Illinois Steel Co., South Chicago; the Crane Co., Chicago; the Western Electric Co., Hawthorne, Ill.; the Pullman Co., Pullman, Ill.; the Green Engineering Co., manufacturer of chain grate stokers and steam jet ash conveyors, East Chicago Ind.; the Hanna Engineering Works, manufacturer of locomotive cranes, pneumatic hoists and riveters, Chicago; the Ilg Electric Ventilating Co., Chicago; the W. A. Jones Foundry & Machine Co., Chicago; the Link-Belt Co., Chicago; Joseph T. Ryerson & Sons, Chicago, and the Rock Island Arsenal, Rock Island, Ill. At Rock Island a special ordnance session was held, at which papers were presented by Col. C. L'H. Ruggles, Major G. F. Jenks, Major L. B. Moody, Major W. B. Hardigg, Major L. O. Wright and Major W. A. Borden.

The next spring meeting of the society will take place at Atlanta, Ga.

David Evans & Co., Chicago representatives of the Sloss-Sheffield Steel & Iron Co., makers of Sloss and Noala pig iron, have moved their offices from the McCormick Building to the Chicago Steel Foundry Co., 3720 South Kedzie Avenue, Chicago. David Evans of David Evans & Co. is also president of the Chicago Steel Foundry Co.



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## A Text from Basic Pig Iron

Whether a given commodity has or has not been sufficiently readjusted is the burden of much that has been written since war prices began to crumble. It is common to say that the farmer already has stood more than his "share"; or that this or that product has come down to the pre-war level; or that, as Judge Gary put it in his address last week, prices still charged for some commodities are "unreasonable and unfair, if not extortionate." Now and then workmen in a certain trade or manufacturers in a certain industry are singled out for condemnation, because in the opinion of some who buy their labor or their product they have not done their part in readjusting. It seems almost to be assumed by some of the critics that a great popular movement is on—comparable with a liberty loan campaign or the raising of a famine relief fund—and that every individual or industry is a shirker or lacks patriotism that has not taken a hand in the surrender of income or profits. The perfectly well-known fact is that manufacturer, workman, middleman, retailer—every link in the industrial or commercial chain—has made no reduction in that which he had to sell except under the compulsion of forces over which he had no control. Upon some the compulsion goes to the point of imposing great hardship and loss. Already there have been heavy losses in many lines and there may be more before anything like stable conditions are reached.

Iron and steel and their products have been pointed to as a class in which the readjustment has not been adequate. Yet iron and steel products differ among themselves in the degree of readjustment, and judgments differ as to the relative fairness or unfairness of current prices. This was made evident at the meeting of the American Iron and Steel Institute last Friday in a comparison made by two speakers as to the proper levels for steel rails on the one hand and sheets and wrought pipe on the other.

Several pig iron producers who have written to THE IRON AGE at various stages in the decline in their market have called attention to the generally unappreciated advance in their costs due to the unprecedented increases in wages and freight rates. The thing has been said so often that it has worn out its first effect. But now that \$22 or less has

been reached in the steady decline of basic pig iron at Mahoning or Shenango Valley furnace, the producer is able to say that his return is actually less than in the year 1913, which by no stretch of the imagination can be put down as a year that yielded a satisfactory profit to any maker of pig iron or steel. A Valley furnace operator whose figures check up both with the market prices reported in 1913 and with the freight increases and the advances in coal and iron mining since that year states the case thus:

*Valley Blast Furnaces in 1913 Derived from Basic Iron*  
\$14.63—Now \$13.73

Average price of basic iron, Valley, in 1913	
fell from \$16.45 in January to \$12.52 in	
December and for the year averaged...	\$14.63
Since that time to the present, freights on	
raw materials assembled at Valley fur-	
nace necessary to make a ton of pig iron	
increased by .....	4.57
Mining charges on necessary coal and iron	
ore per ton of pig iron increased.....	3.70

\$22.90

At present price of \$22, Valley furnace, the buyer of basic iron is paying tribute to the railroads \$4.57 and to the miners of coal and ore, \$3.70. He is paying the blast furnace about 90 cents less than in 1913, notwithstanding the increased cost of money, repairs and materials, including relining materials, all labor for operation and up-keep, taxes and numerous other charges.

The statement might be made another argument for prompt relief from the burden of high freight rates; but that is not the present purpose. It signifies not alone the thoroughness and severity of the readjustment to which one grade of pig iron has been subjected, but emphasizes what has been pointed out in these columns repeatedly—the inequalities in the process of getting down from the high war prices that have brought so large a part of our industrial machinery to a standstill. The figures are apposite to the situation in many another industry. They illustrate again the very large part the time element must play in the process of bringing back prosperity to the country. Whether economy, or willingness to do a full day's work, or respect for law, or a proper regard for the rights of others, or "a disposition to contribute a fair share to the economic readjustment," or any



of the commonly proffered remedies for present conditions be singly or collectively adopted, "time is of the essence"—as the Washington managers of the country's war effort were wont to tell us—and therefore no short cut or magic formula will bring us through. The old way of working and saving must be learned over again. And the fact that a good deal of progress can yet be made in 1921 along this old-fashioned road is at the moment one of the most encouraging things in the outlook.

### Speeding Up the Open Hearth

Two open-hearth furnace men working independently, one in Canada and the other near Chicago, patented about two years ago a modification of the open-hearth furnace which represents a radical change in operation. The facts regarding the patent phase of their parallel research involve almost a romance. Both have recently demonstrated the success of the new departure by actual applications to open-hearth output and the results are highly important. The McCune furnace in Canada and the Egler furnace in the United States bid fair to revise current ideas of open-hearth achievement.

The new principle in the patents referred to involves a throttling of the air supply on the incoming end of the furnace, no matter what the fuel used. A description of the Egler furnace given on other pages clearly defines the change as converting that end of the open-hearth furnace into a "blow-torch." The results claimed include a more efficient heat for melting and refining, a more easily regulated as well as a more complete combustion, much lower stack temperatures, and particularly a speeding up of the production. Results already obtained, whether in the Egler or the McCune furnace, indicate an increased efficiency of 20 to 30 per cent. It is stated that a heat, which ordinarily takes 12 hours to complete, has been finished in eight hours, with no harmful effect on the quality of the metal.

Such speeding up of the open-hearth means much to the future of the steel industry. Applied generally it would, if successful, result in capacity production from a smaller number of furnaces. It has been suggested also that the lowering of the time in which large heats can be produced has an important bearing on the problem of the 8-hour shift, in that it would be possible to produce such heats in less than 12 hours and thus assist in removing what has been advanced as a stumbling block in plants where large heats are the rule.

That so simple an expedient as scientifically regulating the air—by cutting down the supply and placing it under artificial pressure—had not been applied to open-hearth practice earlier is surprising when its efficacy is realized. The general application of the principle, whether by the Egler or McCune furnace or in some other way, may mean for a considerable time the building of fewer furnaces, if all the claims made for it are realized.

The recovery of the Belgian steel industry in 1920 was in remarkable contrast with what happened in 1919. The monthly pig iron output in

1920 was over four and a half times the 1919 record, or 92,700 tons per month against 20,600 tons per month, while last year the steel production was nearly four times that in 1919 or 101,300 tons per month against 27,400 tons per month in 1919. As compared with the country's normal or 1913 output, the recovery was about 50 per cent last year, the pig iron and steel production in 1913 having been 203,800 tons per month for the former and 202,300 tons per month for the latter. Even in the first two months of this year the rate was greater than in 1920, which is not the case in the United States or Great Britain.

### The Institute Meeting

General Pershing has insisted that he is not a public speaker and for a time after returning from France he frequently declined to make speeches at public dinners on the ground that that was not his field of activity; but the American people have a way of developing talent akin to oratory in their public servants and it is fortunate that they insisted upon having General Pershing address them, for to his other great abilities he has added that of a highly acceptable public speaker. His task last Friday night at the dinner of the American Iron and Steel Institute was not an easy one—that of telling briefly what the iron and steel industries had done in the World War, but he performed it in a thoroughly satisfactory manner. His words, published in full elsewhere in this issue of THE IRON AGE, will live as long as the glorious story of industry's part in the war is recounted.

Although removed several thousand miles from the United States during the war, the great soldier saw clearly what was being accomplished in this country. He was calling for steel and more steel, and not only the leaders of the industry but also countless thousands of men in humble positions were straining to the utmost to do their full part. General Pershing said Friday night: "Almost a miracle of production was performed with patriotic energy and efficiency that matched those qualities in our fighting men." He is every inch a soldier, but has the keenest appreciation of the service that was rendered by those who did not have the privilege of going to the front. "In a great national crisis," he said, "the leaders of your industry proved as ardent patriots as the men who carried through the nation's purpose on the battlefield."

Mr. Schwab's earnest appeal to the young men of the industry to take up the work that has been so well done by the older men supplemented well the suggestion of General Pershing that the iron and steel industry record and transmit to generations to come "the knowledge gained by actual experience during the war, to the end that the country may develop during peace the most efficient methods of mobilizing industry and all the industries of the nation, in the event of a future military crisis." One of the best ways of preparing for such a crisis is to meet courageously from day to day the problems of peace.

At the morning meeting of the Institute, the informal discussion of business conditions and possible remedies proved to be a highly interesting feature. Although at other meetings members had been given an opportunity to present their views,

President Gary was urgent in his request on this occasion that anyone who wished to speak, especially if he did not agree with the opinions expressed by the president, should address the meeting. There is a strong sentiment among the members in favor of making expressions of opinion concerning trade conditions more prominent at future meetings. Such an open forum would add to the life of the meetings and increase the influence of the Institute, even if all the members should not be of one mind in regard to every question discussed.

### Fluctuations in Iron Demand

In both pig iron and steel ingots production has dropped to approximately 30 per cent of capacity, a rate far below what used to be thought the possible minimum. This infraction of a formerly well accepted dictum prompts consideration of the circumstances. Is the condition on which demand rests unprecedented, is the capacity unprecedentedly high in relation to actual requirements, or has a definite change occurred in the general character of demand, whereby it is disposed to fluctuate more widely than in the past?

Before the war it was quite commonly thought that the production of pig iron or steel could not decline to below about 60 per cent of capacity even in a time of general business depression and when consumers were drawing upon stocks, if they had any, and buying only from hand to mouth.

To test the accuracy of this dictum in its relation to the then known facts and to show the extent of previous recessions in output, the results of two studies are here presented, one being of the annual production of pig iron and the other of rates of production as shown by THE IRON AGE blast furnace reports. Complete statistics of pig iron production are available only since about 1850. The years since then in which pig iron production was light are given below, also the relation (as expressed in percentage) between the production in each of these years and the highest production previously recorded for a year:

	Per Cent of Record		Per Cent of Record
1858 .....	80	1904 .....	92
1861 .....	80	1908 .....	62
1876 .....	73	1914 .....	75
1885 .....	88	1919 .....	79
1894 .....	72		

Recessions in rates were of course greater. From THE IRON AGE reports it is found that low rates of production compare with the highest rates previously attained as follows:

	Per Cent
November, 1900.....	73
August, 1904.....	62
January, 1908.....	45
January, 1911.....	66
January, 1915.....	53
April, 1921.....	35

In the case of the years the greatest recession before the war was to 62 per cent, in 1908, while in rates the lowest was the 45 per cent rate of January in that year. Previously the recessions had been relatively mild. As to whether a record of steel ingot production would make a materially different showing from that of pig iron, it may be noted that

the 1908 ingot production was 60 per cent of the previous record, while the pig iron production in that year, as shown above, was 62 per cent, the difference being inconsequential.

The present condition as to production is worse than appears from the above table, for in previous recessions the comparison is with a rate of production especially high, possibly higher than could be maintained indefinitely. The production in April of this year, on the other hand, had to be compared with production in October, 1916, which now holds the month's record, although actual capacity to-day is plainly much greater than the output at that time. A fair estimate is that to-day capacity is not less than 46,000,000 tons and that production is at a less rate than 14,000,000 tons, or say at 30 per cent. Substantially the same percentage would apply to steel ingots.

The study of pig iron production from 1850 up to the time of the Great War suggests that the recessions were tending to become more violent. Undoubtedly the proportion of the total iron and steel output used for large construction work has tended to increase. Picks, shovels, planes, locks, hinges, tin cans, pocket knives, nails and a host of things have not increased in size or in frequency of use, but bridges have enormously increased in size, skeleton steel buildings have appeared and many new things, strictly of a constructional character, have been devised. It is construction work in particular that is held back by the present economic conditions. If in the future we are going to have great bursts of construction work invited by low costs of materials and labor, interspersed with periods of high costs, we may look for the iron and steel industry to be more emphatically prince or pauper than when that familiar phrase was coined years ago. The desirability of a curb being applied to the fluctuations in construction costs is emphasized.

It is true, of course, that productive capacity has increased greatly, but in steel the increase, commonly attributed to the war, is only about 50 per cent, while the increase in pig iron is less. The time, moreover, is lengthened, for it is now seven years since steel making capacity was two-thirds as great as at present. In seven years the industry had a perfect right, according to all precedents, to grow as it has done.

A feature of the modern molybdenum structural steels which has been emphasized in technical literature recently has been their wide quenching range available for practical heat treatment, the excellent penetrative effect on large sizes and the broad drawing range insuring at the same time but slight modifications in static properties. Information as to dynamic properties under the same conditions was lacking, until the presentation recently of a paper on these steels before the Washington chapter of the American Society for Steel Treating. An abstract appears elsewhere in this issue. The average results of a series of experiments in the author's laboratories show no marked variation in impact and static properties under varying quenching temperatures. Over a range of 1500 to 2000 degrees Fahrenheit inclusive, the Izod results varied but 7 points, the tensile strength but 6500 lb. per



sq. in. and the elastic limit only 3700 lb. per sq. in. in relatively high values, with correspondingly close limits in other properties. This was on a regular chrome-molybdenum steel. These values are striking and have their commercial as well as technical significance. The practical value, often emphasized, lies in a degree of insurance of proper results even when the treatment of such steels is in the hands of less experienced workers. This is often a consideration, particularly in connection with drill steel. But aside from such steel, it is doubtful if the wide quenching range should be relied upon, to the exclusion of the most careful manipulation.

## CORRESPONDENCE

### Colored Newspaper Headlines

*To the Editor:* Almost daily as one picks up the morning paper his eye catches such headlines as "Employers Win Great Victory," "Labor Will Fight Reduction." While we are apt to fancy ourselves independent in our thinking, the average man can only form his opinion on most current happenings from what he reads in the daily paper.

The negotiations between employer and employee, whether relating to wages or other matters, are just as much a part of business routine as negotiations between two different concerns. There is no inclination to resort to violence and they meet and part without any physical signs of disagreement.

"As far as the writer has been able to observe the employer, where the industry is great enough to occasion public comment, has announced any wage adjustment in a dispassionate presentation. The employee as a rule has said nothing, having gone back to or continued his work. The newspaper however seizes upon such pronouncement and proceeds to work it up into a class war.

With all due respect to our public press, this is a pernicious practice and we wish we could believe that it is not deliberately disregarding of the psychological effect. Strange to say the only parallel we find to these headlines is in the quoted utterances of certain leaders of organized labor. Do the newspaper editors want us to believe that they are more interested in endorsing the expressed sentiments of the 15,000 leaders than in representing fairly those who contribute the \$60,000,000 upon which the 15,000 live? To say nothing of the vast body of unorganized labor.

Periodicals of the type of THE IRON AGE know the true inwardness of their negotiations between employer and employee and it would seem that they have sufficient influence in the publishing field to call a halt on this practice of the dailies. Why not get busy!

H. D. MURPHY.

Medford Hillside, Mass., May 17.

### Consideration Asked for Cuba

*To the Editor:* This month and the coming ones of June and July we are sure collections will be somewhat delayed, taking into consideration that sugar has reached its bottom price and the financial sales commission will not make any offer, until present stocks in Europe and United States are sold, so that probability of getting higher prices may be obtained.

Sugar present price is of 3% per 100 lb. This price doesn't cover the cost of production. A stock of about 1,200,000 tons of sugar is estimated to be warehoused in the various ports of Cuba. If held for sale at 4.50c., the \$125,000,000 will be enough to bring things to the ordinary level. Besides this, we have a large tobacco crop to be moved.

In our judgment, manufacturers, shippers, etc., who

may have outstanding accounts on Cuban customers should go slow, giving time, or else the situation will grow worse. We have confidence that the situation will improve and everything will be settled satisfactorily.

The new Cuban Government is composed of honest and patriotic men who, the country has ample confidence, are animated by the best motives. Cuba is a rich country which has big interests, financial and political, with the United States. That country should help and the American manufacturers should ask from Washington protection in the new duties tariff, as we are sure that Cuba proportionately is the best market for United States products.

J. A. VAZQUEZ,  
Commission Merchant.

Havana, Cuba, May 18.

### Steel and Iron Used in New York

Steel and iron used in New York bridges under the jurisdiction of the City Department of Plant and Structures amounts to date to 240 500 tons, according to figures compiled by the Industrial Bureau of the Merchants' Association. Of this amount, 204,500 net tons is in the Brooklyn, Manhattan, Williamsburg and Queensboro bridges over the East River.

For the East River tunnels constructed by the Public Service Commission the following tonnages of cast iron were used:

	Tons
Fourteenth Street-North Seventh Street.....	43,500
Old Slip-Clark Street .....	36,150
Whitehall Street-Montague Street .....	37,200
Willoughby Street-Fulton Street .....	22,100

It is estimated that the amount of cast iron required for the vehicular tunnel, if constructed by the shield method, will be about 115,000 tons.

Since 1900 the following quantities of structural steel and cast iron have been used in rapid transit railroad construction in New York.

	Tons
Subways and elevated lines .....	840,000
Cast-iron tunnel lining for above structures .....	179,000

These figures do not include miscellaneous materials, such as rails, miscellaneous castings and steel and iron for sub-surface structures other than subway structures, which in the total amount to a large tonnage.

The William B. Pollock Co., fabricating interest of Youngstown, Ohio, recently shipped materials for two 55,000 bbl. oil tanks to Spain, the shipment going forward to the Asiatic Petroleum Co. The tanks will likely be erected inland from the point of entry. They will be 114 ft. 7 in. in diameter and 34 ft. 4 in. high, and will have self-supporting roofs. The shipment comprised 12 carloads.

### The Iron Age and Its Readers

Few readers comprehend how many are the trade and technical associations the activities of which are followed by THE IRON AGE. The broad contact with reader interest of some of the organizations requires extensive reporting, but in all cases the purpose of the editors is that nothing of importance to producers and consumers in the metal working industries shall be overlooked.

In the issue of May 26 it will be found that 26 different associations for advancing trade or technology were covered in one way or another. Two thousand telegraphed words of highly informing discussions which took place late Tuesday at the Chicago meeting of the American Society of Mechanical Engineers were put in printed form before subscribers several hundred miles from New York on Thursday morning. A detailed report of the Iron and Steel Institute meeting in London on May 5 and 6 was given in the same issue. As examples of good performance, they are not IRON AGE records, but the mention helps to visualize the weekly service continuously given by this journal.

## ONLY TWENTY PER CENT

### Small Ingot Production in Mahoning Valley— Price Shading on Some Products

YOUNGSTOWN, OHIO, May 31.—Steel buyers are still marking time and Mahoning Valley mill operations reflect the uncertainty which characterizes the market. Makers are hopeful, however, that the immediate future holds better things in store. A district fabricating interest has booked 10 carloads of metal lath and a large order for special stampings. The A. M. Byers Co., Pittsburgh, has temporarily introduced the 6-hr. day in its puddle department at Girard, Ohio, operating 22 furnaces this week on such a basis. Indicating the stagnation in buying is the low state of ingot production, averaging but 20 per cent this week with independent interests. Sheet mill production is less than one-third of normal, with the active units divided among four producers.

The heaviest operating cut is reported by the Youngstown Sheet & Tube Co., which is at the lowest ebb this year, its steel plant being wholly idle.

Standard basic pig iron is now quotable at \$21.50 to \$22 in the Valley. Quotations of \$21.50 and \$21.75 were made last week on inquiries for 500 tons and 1000 tons respectively, put out by Pittsburgh steel companies. Most of the current business is in small lots, from 50 to 100 tons. Bessemer iron has been sold at \$24.

Brier Hill Steel Co. and Newton Steel Co. are each operating 10 sheet mills this week, while Falcon Steel Co. and Trumbull Steel Co. have six each under power. Makers of full-finished for the automobile trade are maintaining a better operating rate than producers of the other grades.

#### Evidence of Price Shading

Evidences are multiplying that business is being accepted in most finished lines under the nominal quotations, and there is a well-defined belief among district manufacturers that lower prices are at hand. It is felt, however, that a reduction at this time would be of little benefit to the trade and would have little value in stimulating new business.

Sheet tonnage is being accepted by some makers on the basis of 2.75c. for blue annealed, 3.85c. for black and 4.85c. base for galvanized, these prices comparing with nominal quotations on the grades mentioned of 3c., 4c. and 5c. Several Valley sheet makers are shipping to the Ford Motor Co., while a district strip steel producer has his capacity partially engaged on an order for the Ford company, accepted at a concession price.

Aside from business placed by the Ford Motor Co., no sizable orders for sheets are coming into the Valley. In some cases small orders, involving 5 and 10-bundle lots, are being filled from stock. One maker submitted a price of 3.70c. on an inquiry for 5000 tons of black sheets, one by-pass, which circulated through this territory last week.

At the moment very little plate tonnage is being placed, production not averaging over 15 per cent of capacity. One interest has its plate mill indefinitely suspended. Buyers confidently state that tonnage is available under the 2.20c. base price and say that plates are purchasable at 2c.

#### Improvement in Pipe

The past 10 days have witnessed a momentary upturn in pipe buying, which has averaged from 40 to 50 per cent with an independent maker, as compared with 12 to 20 per cent just previously. The May average of new business, however, was only 60 per cent of that in April with a local maker. While some concessions have been made in prices, the bulk of the material has been placed at the nominal levels, producers declare.

Some improvement has been registered the past week in buying of wire nails and other wire products, the ruling base price continuing at \$3. Mill operations are less than 40 per cent.

Tinplate buying has fallen away and production with district interests is under 30 per cent.

Concessions on sheet bars are being offered by makers, ranging as high in some cases as \$3 per ton. Very little new business is being placed, though non-integrated makers of sheets are specifying against contracts as their requirements warrant.

In view of the extremely light blast furnace operation, the fuel market is listless. Three-quarter gas coal is readily available in the spot market at \$2.75, f.o.b. mine, while steam coal is 25c. cheaper. Steam coal slack has been offered in the Valley at \$1.60 mine. Spot furnace coke is nominally \$3.25 to \$3.50, and the coke market is reported to be slightly more active.

### Dull Period for Refractories

PITTSBURGH, May 30.—The refractories industry is passing through one of the dullest periods in its history and the prospect for any immediate improvement is considered poor. Conditions in this market reflect closely those which exist in the iron and steel industry, due to the fact that the latter provides more than 90 per cent of the business in fire clay brick and other refractories. Few people expect the iron and steel business to pick up much until after Sept. 1, and since consumers' stocks of brick are fairly large, it probably will be some time after the iron and steel business gets better before there will be a corresponding increase in demand for refractories.

Plant operations are rather difficult to estimate in view of the fact that a number of plants are operating three and four days a week while others are running every day, but on curtailed working schedules. A number of plants are completely down, these being the smaller units which have rather high costs. As nearly as can be estimated, about 20 per cent of the country's capacity is engaged. Even this low rate of production, however, is proving ample for current requirements, and while prices are unchanged, it would be an exaggeration to say they were firm. Quotations are observed fairly closely, chiefly because there is considerable doubt that further concessions at this time would be productive of business. It is believed there would be considerable sharpening of pencils on the appearance of a really attractive order in fire clay brick.

We quote per 1000 f.o.b. works:

Fire Clay:	High Duty	Moderate Duty
Pennsylvania .....	\$36.00 to \$43.00	\$30.00 to \$36.00
Ohio .....	36.00 to 40.00	30.00 to 35.00
Kentucky .....	36.00 to 40.00	34.00 to 38.00
Illinois .....	40.00 to 45.00	30.00 to 40.00
Missouri .....	45.00 to 50.00	35.00 to 40.00
Silica Brick:		
Pennsylvania .....		35.00 to 40.00
Chicago .....		42.00 to 45.00
Birmingham .....		46.00 to 50.00
Magnesite Brick:		
Standard size, per net ton .....		75.00
Chrome Brick:		
Standard size, per net ton .....		65.00

The operating schedule at the Farrell works of American Sheet & Tin Plate Co. for the week of May 23 is the same as that of the previous week. The sheet mills will work at full capacity and 16 of the 30 hot tin mills will be in operation. The mills of the company at New Castle, Pa., which have been running about 50 per cent capacity, will be down this week.

The Cortland Grinding Wheel Co., Cortland, N. Y., has combined its business with the Maxf Grinding Wheel Corporation, Chester, Mass., and the product of both companies will be manufactured in Massachusetts. Officers of both companies will remain as at present. The Cortland plant was destroyed by fire during the latter part of 1920.

The Atlas Die-Casting Co., Inc., 41 Jackson Street, Worcester, Mass., expects to begin operations about July 1. When operating at capacity, approximately 300 men will be employed. Arthur M. Brewster, Brookline, Mass., is president, and Malcolm F. MacNeil, Boston, treasurer.



## INDUSTRIAL COST MEETING

### Practical Rather Than Theoretical Methods Emphasized Last Week at East Aurora, N. Y.

Some 60 cost and accounting officials, representing almost that many different manufacturing companies attended the national industrial cost conference at the Roycroft Inn, East Aurora, N. Y., May 26, 27 and 28, held under the auspices of the Industrial Cost Association. Quite in keeping with the environment, the various sessions were marked by earnest and serious consideration of the several papers presented, and there is no doubt that the prime object of the association, of solving cost problems by discussions by cost executives instead of the application of commercial systems took firm root. The Industrial Cost Association still is a young organization and its foundation is based upon the belief that no cost finding system yet has been devised which is applicable to all industries and that manufacturers are likely to find the solution of their cost problems in an exchange of ideas with their fellow-manufacturers. Practical rather than theoretic cost systems is what the association seeks to establish and the distinction between the two kinds was sharply brought out in the papers presented by Robert E. Belt, secretary American Malleable Castings Association, Cleveland, and E. M. Brown, chief cost accountant, American Blower Co., Detroit, as well as in the discussion of these papers at the morning session of May 27.

"Current Influences on Cost Problems," was the general subject of the opening session. J. W. Stannard, secretary-treasurer American Autoparts Co., Detroit, and first vice-president of the association, who presided at the sessions in the absence of M. F. Simmons, assistant manager, General Electric Co., Schenectady, N. Y., president of the association, and Horace S. Peck, comptroller, S-K-F Industries, Inc., New York, were the introductory speakers. Both stressed the necessity of a reduction in retail prices to a point where they matched current factory or wholesale prices as the most essential requirement to a speeding up of the industrial and economic readjustment now in progress. Mr. Peck charged that some gross profiteering still was going on among retailers, citing a case where the retail price of an article had been cut only from 60c. to 50c., against a drop of from 40c. to 20c. in the corresponding wholesale price. "The cost department is in a better position to suggest economies," said Mr. Peck, "than any other department because it has before it at all times the actual figures for the entire organization."

#### Conditions in Automotive Industry

Conditions in the automotive industry were reviewed by Mr. Stannard, who said this industry was selling its product below cost. He said the industry might brace when the demand disclosed a shortage of vehicles, but was inclined to believe the betterment would be short-lived until the readjustment process had been entirely completed.

G. A. Moore, secretary-treasurer Detroit Range, Boiler & Steel Barrel Co., Detroit, in telling how his company had met the reaction in business said that the cost finding department had been augmented and directed to get at costs in greater detail to find the leaks and eliminate waste. The result was a cut in production costs, to which had been added a reduction in piece work wages. The wage revision did not affect shop bonuses or welfare activities and consequently, the morale and personnel of the organization were preserved. His company, Mr. Moore said, had in this fashion solved the problem which had bothered so many manufacturers in the past eight months.

#### Taking Care of Abnormal Burden

H. B. Pavitt, chief accountant, and W. L. Erdman, chief cost accountant, Allegheny Steel Co., Brackenridge, Pa., jointly, Thomas J. Haley, treasurer Fawcus Machine Co., Pittsburgh and Ernest J. Wesson, industrial engineer, W. T. Rawleigh Co., Freeport, Ill., presented papers at Thursday evening's session on the

question, "Should Abnormal Burdens Be Included in Current Monthly Costs?"

The speakers all made an affirmative answer, but there was doubt as to what constituted "abnormal" costs and one speaker would include it monthly, because it had to be included somewhere and some way. A vote taken after the discussion, which was extremely lively, disclosed that a majority of the delegates was opposed to inclusion of the charge in monthly costs.

Uniform cost systems were under discussion at the morning session of May 27, and the papers and discussions generally brought out that a system adaptable to all industries in common was out of the question and that each industry must work out its own system based upon the experiences of those engaged in the particular industry. Uniform cost systems from the standpoint of the trade associations was covered by Mr. Belt and from the user's viewpoint by E. M. Brown. Both speakers agreed as to the futility of a hard and fast system for all industries and supported the idea of individualistic methods. Mr. Brown observed that practically all so-called uniform cost systems were worked out from an accounting standpoint with the balance sheet as the fountain head, with the result that too much importance had been given accounting problems at the expense of cost and manufacturing requirements.

Working from the balance sheet down, he argued, led to the development of a standardized basic chart of operating accounts, worked back from bare accounting factors instead of up from actual operating requirements. The principles and purposes of all cost systems are identical regardless of the nature of the product manufactured, but the fact that one line will represent 90 per cent labor and burden, while another's will represent 90 per cent purchased materials, means that the principles used in determining costs are the same, but the requirements and manner in which the factors that enter into the cost are gathered and determined are dissimilar.

#### Uniform Basis of Figuring Costs

Discussion of the papers disclosed that a simple, practical, uniform basis of figuring costs was what was desired instead of a uniform system of costs. It was said by some that uniform costs were not wanted for this might mean uniform prices and this as well as average costs were to be avoided on legal grounds.

Addison Boren, manager works accounting bureau, Yale & Towne Mfg. Co., Stamford, Conn., opened the afternoon session, May 27, with a paper on "Standardization of Cost Terminology and Fundamental Principles." He drew attention to the use by some of "overhead" and of others of "burden," when referring to the same item. A paper by G. K. Wilson, assistant secretary, Sullivan Machinery Co., Chicago, suggested the use of the terms now employed by the treasury department in tax return blanks. C. Haigh, cost superintendent, General Electric Co., Lynn, Mass., read excerpts from the code of his company. The suggestion was made by G. A. Moore, Detroit Range, Boiler & Steel Barrel Co., that a national committee be appointed to receive lists prepared by each section of the association and to issue bulletins giving decisions on disputed terms.

At the banquet Friday evening it was announced that M. F. Simmons had resigned as president of the association and that J. W. Stannard had been elected to succeed him. Mr. Simmons remains a national director of the organization. The human side of the application of cost systems was touched upon by Harry Tipner, manager *Automotive Industries*, New York and I. H. Mills, superintendent Sperry Gyroscope Co., Brooklyn.

At the closing business session on May 28, an executive committee composed of J. W. Stannard, Detroit; Horace S. Peck, New York, and G. K. Wilson, Chicago, was established to share the burden of management. Mr. Peck also was named as head of a committee to prepare for the next national conference to be held in the fall in conjunction with the first annual convention of the association, which will be held in Pittsburgh, Detroit or Cleveland.

# Iron and Steel Markets

## LOOKING FOR LOWER PRICES

### Buying in All Lines Closely Restricted

#### Some Foreign Railroad Business—Cast Iron Pipe Reduced—Fabricating Prices Low

Buyers of iron and steel continue to act on the belief that lower prices are ahead, and the few current transactions that count at all give encouragement to that belief. The old question of the attitude of the Steel Corporation toward concessions made by its competitors is up again in view of some recent transactions in plates, bars, wire and wire nails. Though there are few products on which the prices that went into effect April 13 are strictly observed, the variations in wire are particularly a matter of comment.

The view that price cutting cannot be effective in a time of low-ebb demand is still held by some important producers; at the same time the Steel Corporation and such independents as have held to the schedule are not expected to "hold the umbrella" indefinitely.

The railroads still are tightening up as buyers and at the same time intimating that they should buy steel at lower prices. The steel trade is not now so much concerned about lower freights preceding lower steel prices, since it sees both impending.

While the Steel Corporation's schedules this week amount to a 38 per cent operation, independent companies are at about 25 per cent. New business is coming to the Steel Corporation's books at a rate below 20 per cent of capacity. The fair promise some independent mills had in early May fell away in the latter part. Efforts are now concentrated on the equitable distribution of the small amount of work among all employees. A further reduction in wages in the next 90 days is not improbable.

An Eastern order from the Pennsylvania Railroad for about 1800 tons of tie plates is conspicuous in the general dearth. Eastern mills in general are operating on a smaller scale this week.

Iron and steel exports in April, at 162,000 tons, were only 40 per cent of the monthly average for 1920, being the smallest month's total in seven years. From the January peak of 647,000 tons the descent seems precipitous, but the January figures represented in part shipments of late 1920 of which statistics had been carried over.

Some export business is coming along, in part at the expense of Great Britain's paralyzed industry. Three inquiries for rails for India amount to 11,000 tons, the Tata mill in Bengal being supplied with rail business for some time. As was expected following the war, the railroads of the world are all at work at rehabilitation.

The leading merchant iron producer in the Chicago district reports that shipments for May exceeded those for April by 40 per cent, but the

current business in the Chicago district, as well as in other centers, is extremely light and the price tendency is still downward. Resale iron has not yet disappeared but continues to have a depressing effect on the market.

The leading cast iron pipe maker has reduced prices, including fittings, to a \$45 Birmingham basis, in the hope that municipal buying will be encouraged.

Three railroad car repair inquiries have come into the market in the week. An order for 100 locomotives for the Mexican National Railways has been divided equally between the American and Baldwin locomotive companies.

Fabricated steel prices appear to be wholly influenced by the desire to keep organizations intact, so that cheaper plain material would make little difference. The low bid for the 3050-ton Belle Isle bridge, Detroit, was \$114.75 per ton erected.

Owing to the large accumulation of ore on docks and in furnace yards, Lake Superior producers have found few furnaces interested in making reservations, even with prices to be fixed later. April consumption of Lake ore was 1,675,000 tons, compared with 4,000,000 tons in April, 1920.

## Pittsburgh

PITTSBURGH, May 31.

There has been no important change in the character of the demand for iron and steel, buyers still confining purchases to actual needs and showing no interest in the future requirements. The belief that still lower prices are ahead grows stronger and since this development is bound up closely with freight rate reductions and these cannot very well come before wages are reduced, the expectation that the summer will be an extremely quiet one has become common.

With regard to prices the market must be said to be rather irregular, due to the fact that there are two classes of thought among the manufacturers. One group is not actively pushing for business and is closely adhering to the stabilized bases of April 13 even to the extent of allowing their plants to shut down, while the other group is soliciting orders and, when occasion requires, is cutting prices for the purpose of securing enough business to keep some capacity in operation. There are very few products in which some concessions are not being made. The most notable instance of this sort is to be found in wire products. While still quoting the April 13 schedule, it has become known that some of the independent companies to secure orders would go as low as \$2.75 for plain wire, thus maintaining the usual spread of \$5 per ton between this product and bright nails, which have not been readily salable at above \$3 since it became known a few weeks ago that one or two manufacturers would take business at that price.

The week has been an uneventful one in pig iron, sales of which have been entirely in small lots at substantially unchanged prices. The most active spot in rolled steel products is tubular goods, but even in this class the demand has been chiefly for the rounding out of existing stocks. The scrap market has lapsed back into dullness and so little is going on in coke that prices are not especially well defined.

**Pig Iron.**—It is impossible to chronicle any material change in the pig iron market. Business is extremely limited and there are very few inquiries on the market. The West Penn Steel Co. is reported



## A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery

Pig Iron, Per Gross Ton:	May 31, 1921	May 26, 1921	May 3, 1921	June 1, 1920
No. 2X, Philadelphia...	\$25.50	\$25.50	\$25.84	\$47.15
No. 2, Valley furnace...	23.00	23.00	24.00	45.00
No. 2, Southern, Cin'ti...	26.50	26.50	27.50	45.60
No. 2, Birmingham, Ala...	22.00	22.00	23.00	42.00
No. 2, foundry, Chicago...	22.00	23.00	23.00	43.00
Basic, del'd, eastern Pa...	25.00	25.00	25.00	44.80
Basic, Valley furnace...	21.75	21.75	22.50	43.50
Bessemer, Pittsburgh...	25.96	25.96	26.96	44.40
Malleable, Chicago...	22.00	23.00	24.00	43.50
Malleable, Valley...	24.00	24.00	24.50	44.00
Gray forge, Pittsburgh...	23.96	23.96	24.96	43.40
L. S. charcoal, Chicago...	37.50	37.50	38.50	57.50
Ferromanganese, del'd...	30.00	30.00	30.00	225.00

Rails, Billets, etc., Per Gross Ton:	May 31, 1921	May 26, 1921	May 3, 1921	June 1, 1920
Bess. rails, heavy, at mill.	\$45.00	\$45.00	\$45.00	\$55.00
O.-h. rails, heavy, at mill.	47.00	47.00	47.00	57.00
Bess. billets, Pittsburgh...	37.00	37.00	37.00	60.00
O.-h. billets, Pittsburgh...	37.00	37.00	37.00	60.00
O.-h. sheet bars, P'gh...	39.00	39.00	39.00	80.00
Forging billets, base, P'gh...	42.00	42.00	42.00	80.00
O.-h. billets, Phila...	42.74	42.74	42.74	64.10
Wire rods, Pittsburgh...	48.00	48.00	48.00	75.00
Skelp, gr. steel, P'gh., lb.	2.20	2.20	2.20	2.75
Skelp, sh. steel, P'gh., lb.	2.20	2.20	2.20	3.00

Finished Iron and Steel, Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Iron bars, Philadelphia...	2.25	2.25	2.35	4.25
Iron bars, Chicago...	2.25	2.38	2.38	3.75
Steel bars, Pittsburgh...	2.10	2.10	2.10	3.50
Steel bars, New York...	2.48	2.48	2.48	4.02
Tank plates, Pittsburgh...	2.20	2.20	2.20	3.75
Tank plates, New York...	2.58	2.58	2.58	4.02
Beams, etc., Pittsburgh...	2.20	2.20	2.20	3.10
Beams, etc., New York...	2.58	2.58	2.58	3.27
Steel hoops, Pittsburgh...	2.75	2.75	2.75	5.00

\*The average switching charge for delivery to foundries in the Chicago district is 70c. per ton.

†Silicon, 1.75 to 2.25. ‡Silicon, 2.25 to 2.75.

The prices in the above table are for domestic delivery and do not necessarily apply to export business.

Sheets, Nails and Wire, Per Lb. to Large Buyers:	May 31, 1921	May 26, 1921	May 3, 1921	June 1, 1920
Sheets, black, No. 28, P'gh.	4.00	4.00	4.00	5.50
Sheets, galv., No. 28, P'gh.	5.00	5.00	5.00	7.00
Sheets, blue an'd, 9 & 10.	3.10	3.10	3.10	4.50
Wire nails, Pittsburgh...	3.00	3.00	3.00	3.25
Plain wire, P'gh...	3.00	3.00	3.00	3.50
Barbed wire, galv., P'gh...	4.10	4.10	4.10	4.45
Tin plate, 100-lb. box, P'gh.	\$6.25	\$6.25	\$6.25	\$7.00

Old Material, Per Gross Ton:	May 31, 1921	May 26, 1921	May 3, 1921	June 1, 1920
Carwheels, Chicago...	\$14.00	\$15.00	\$14.50	\$36.00
Carwheels, Philadelphia...	18.00	18.00	16.00	38.00
Heavy steel scrap, P'gh...	13.50	13.50	13.00	25.00
Heavy steel scrap, Phila...	12.00	12.00	11.00	22.50
Heavy steel scrap, Ch'go...	11.50	11.50	11.50	22.50
No. 1 cast, Pittsburgh...	18.00	18.00	18.00	32.00
No. 1 cast, Philadelphia...	18.00	18.00	18.00	37.00
No. 1 cast, Ch'go (net ton)	13.50	13.50	13.50	36.50
No. 1 RR. wrot, Phila...	15.00	15.00	15.00	33.00
No. 1 RR. wrot, Ch'go (net)	10.50	10.50	10.00	25.50

Coke, Connellsville, Per Net Ton at Oven:	May 31, 1921	May 26, 1921	May 3, 1921	June 1, 1920
Furnace coke, prompt...	\$3.25	\$3.25	\$3.25	\$14.00
Furnace coke, future...	3.40	3.40	3.40	14.00
Foundry coke, prompt...	4.50	4.50	4.50	15.00
Foundry coke, future...	5.00	5.00	5.00	15.00

Metals, Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York...	13.25	13.25	12.75	19.00
Electrolytic copper, N. Y.	13.25	13.25	12.37½	19.00
Zinc, St. Louis...	4.75	4.75	4.95	7.70
Zinc, New York...	5.25	5.25	5.45	8.05
Lead, St. Louis...	4.70	4.80	4.50	8.15
Lead, New York...	5.00	5.10	4.50	8.50
Tin, New York...	31.50	32.25	31.87½	61.50
Antimony (Asiatic), N. Y.	5.25	5.25	5.25	9.00

to have bought 500 tons of basic iron at \$23 delivered. This would be equivalent to about \$21, Valley furnace, as the freight from the Valley district to Brackenridge, Pa., is \$1.96. The business was taken by a firm the chief business of which is scrap iron and steel, however, and it is barely possible that the iron may come from some other point. The price of \$23.50 delivered is said to have been named against an inquiry for 500 tons of basic by the Allegheny Steel Co., also at Brackenridge, Pa. No business worthy of comment recently has been done in Bessemer iron and transactions in foundry iron have been altogether in lots of a carload or two, these carrying a price of \$23, Valley furnace, for No. 2. Some of the merchant producers express the belief that prices will not go much lower in the immediate future because the position of the market at least as far as stocks of foundry are concerned, is much stronger than it was a few weeks ago.

We quote Valley furnace, the freight rate for delivery to the Cleveland or Pittsburgh district being \$1.96 per gross ton:

Basic	\$21.75
Bessemer	24.00
Gray forge	22.00
No. 2 foundry	23.00
No. 3 foundry	22.50
Malleable	24.00

**Ferroalloys.**—Effective May 25, Jackson, Ohio, producers of Bessemer ferrosilicon and silvery iron reduced prices \$3 per ton. This brings ferrosilicon to \$45 furnace for 10 per cent and silveries to \$35.50 furnace for 8 per cent. This cut has been ineffective as a stimulus to sales and it is generally stated here that even the new prices are considerably above what could be obtained. Business in ferroalloys generally is dull, with prices in buyers' favor on such sales as are being made. Swedish ferromanganese has been offered at \$75 delivered Pittsburgh district, and this is being used

by prospective buyers as a lever to further depress prices of domestic material. Little is going on in spiegeleisen and inquiries for 50 per cent ferrosilicon are few and small.

We quote 76 to 80 per cent ferromanganese at \$50 to \$82.50 delivered on domestic; 78 to 82 per cent, \$85; English, 76 to 80 per cent, \$75, c.i.f. Atlantic seaboard. We quote average 20 per cent spiegeleisen at \$32.50 furnace quoted by makers on direct business and \$28 to \$30 furnace on resale tonnages; 50 per cent ferrosilicon, \$70 to \$80 furnace, freight allowed, for domestic and \$80 to \$85 delivered for foreign material. Bessemer ferrosilicon is quoted f.o.b. Jackson County and New Straitsville, Ohio, furnaces, as follows: 9 per cent, \$41.50; 10 per cent, \$45; 11 per cent, \$48.50; 12 per cent, \$51.60. Silvery iron, 6 per cent, \$32; 7 per cent, \$33.50; 8 per cent, \$35.50; 9 per cent, \$37.50; 10 per cent, \$40; 11 per cent, \$43.30; 12 per cent, \$46.60. The present freight rate from Jackson and New Straitsville, Ohio, into the Pittsburgh district is \$4.06 per gross ton.

**Billets, Sheet Bars and Slabs.**—Interest in the market still is low because of the limited and irregular demand for finished products which naturally is reflected back to the semi-finished material. Buyers are not purchasing very far ahead of actual needs, as they expect prices to work lower and want to be in position to take advantage of any such changes. Quotations are nominal.

We quote 4 x 4-in. soft Bessemer and open-hearth billets at \$37; 2 x 2-in. billets, \$39; Bessemer and open-hearth sheet bars, \$39; slabs, \$38; forging billets, ordinary carbons, \$42, all f.o.b. Youngstown or Pittsburgh mills.

**Wire Rods.**—Demands still are few and small, and while makers in this district are observing the April 13 base of \$48 f.o.b. Pittsburgh for soft rods, the fact that the War Industries Board regulations made Youngstown as well as Pittsburgh a basing point is being taken advantage of now and this means that some rods are being moved at less than \$48 Pittsburgh. Prices are given on page 1506.

**Iron and Steel Bars.**—Demand for steel bars still is for small lots for immediate shipment, and mill operations are up and down as orders are accumulated and worked off. Generally, there is close observance of a base of 2.10c., but the report is persistent that this price has been shaded by some makers anxious to maintain working organizations. Iron bars are publicly quoted at 2.75c. for refined iron, but firm bids of less are getting consideration.

We quote steel bars rolled from billets at 2.10c.; reinforcing bars, rolled from billets, 2.10c. base; reinforcing bars rolled from old rails, 1.90c. to 2c.; refined iron bars, 2.75c.; in carloads, f.o.b. mill, Pittsburgh.

**Structural Material.**—Fabricating interests here have been getting a fair number of small jobs, but nothing big lately has come out and the impression prevails that until the labor and freight rate matters have been adjusted, there will be considerable caution among investors. It is reported that building contractors here have served notice upon the trades unions that unless the latter accept a new agreement calling for lower scales, the former will adopt the American plan or open shop. Plain material still is slow of sale, because most of the fabricating companies have stocks which are ample for current requirements. Plain material prices are given on page 1506.

**Cold Finished Steel Bars.**—Demands upon makers here do not increase much, either in number or in size. Sizable orders probably would bring concessions from the regular market price of 3.10c. base, Pittsburgh, but the orders offered are so small that they provide no temptation to shade that figure.

**Steel Skelp.**—Supplies are ample for all current needs and if there is a definite tendency to prices it is in buyers' favor. Eastern makers are reported to be willing to accept business at well below the stabilized price of 2.20c. Pittsburgh.

**Hot-rolled and Cold-rolled Strips.**—Business at best is only fair. There is rigid adherence on the part of makers representing a large part of the production to the stabilized basis of 2.75c. for hot-rolled and 5.50c. base for cold-rolled, but the effect of the sharp concessions made by one or two makers on the Ford business placed a few weeks ago has not been dissipated and, expecting possible price cuts, buyers are not anticipating their needs.

**Plates.**—Only occasionally are makers in this district called upon to quote upon more than one or two carloads. Against such business 2.20c. is generally quoted, but if there were any sizable inquiries, there is little question a lower price would be named.

**Hoops and Bands.**—Interest in these lines rarely has been so small as at present. Apparently, such demands as are coming out are being met from stocks, as the mills of an important independent here are down. The quotable market still is 2.75c., but there is doubt that this price could be obtained or even named against a sizable order.

**Nuts, Bolts and Rivets.**—The market is dull and unchanged. Buyers are ordering and specifying with extreme caution and while plants here are running part time, the bulk of the production is going into stock. Orders in all three products are of retail proportions. Prices and discounts are given on page 1506.

**Spikes.**—Interest in railroad spikes is small. Most of the roads have some stock and since makers are in a position to ship quickly against new demands, the requirements of the rail laying period are not being sought. Large spikes still can be had from Eastern makers as low as 3.25c. base, but on the smaller sizes, the stabilized base of 3.40c. finds rather general observance. Prices are given on page 1506.

**Iron and Steel Pipe.**—Business is purely of a pick-up character; that is, distributors merely are specifying for such tonnages as are actually needed, and in this connection merchant pipe is doing rather better than oil country goods. Some jobbers are asking that shipments against some of their recent orders be deferred, because of the expectation of a considerable

saving when freight rates are revised. Coast jobbers expect to effect considerable saving by holding up shipments until freight rates are cut. Discounts are given on page 1506.

**Sheets.**—Purchases still are few and small, but most makers, notably the American Sheet & Tin Plate Co., are in receipt of a fair number of specifications against old contracts. Taking the industry as a whole, it is doubtful whether 30 per cent of the mills are in operation. Surprisingly little price cutting is going on, but this may be ascribed to the unattractive character of inquiries rather than a strong stand on the part of makers. Prices are given on page 1506.

**Tin Plate.**—It is doubtful whether the industry ever before experienced such a lean period at this time of the year in the matter of orders as is now the case. No production orders are being placed, consumers merely specifying against such unshipped tonnages as still are due them and meeting such other needs as come up from stock items. The latter, "sweetened up" with standard plate, are available at \$5.75 per base box and are said to have gone as low as \$5.50 as compared with the market base of \$6.25 on standard tin plate.

**Wire Products.**—The market is dull and concessions are beginning to appear in prices of other products besides nails. Although \$2.75 hardly can be said to be a public quotation on plain wire, some of the independents probably would go that low to secure orders. This is \$5 per ton below the recent regular quotation and the cut extends to galvanized barbed wire, a quotation of \$3.85 having been made on the latter. Sales of nails at higher than \$3 per keg, Pittsburgh, have been difficult since the news leaked out a few weeks ago that this price had been quoted against a good-sized inquiry from an oil company. There is an impression that the American Steel & Wire Co. will not stand aloof in the event that the several independent companies adopt the low prices to which they are privately prepared to go to secure business as public quotations.

We quote wire nails at \$3 to \$3.25 base per keg, Pittsburgh, and bright basic and Bessemer wire at \$3 base per 100 lb. Pittsburgh.

**Coke and Coal.**—The present spot market in furnace coke is indefinite because demands and production both are so limited. As nearly as the market can be appraised, the range of the past few weeks of \$3.25 to \$3.50 per net ton oven still prevails. While a good many operators are not prepared to start up idle ovens on business carrying a price of less than \$3.50, others whose ovens are in operation have some coke for sale and find that sales are not readily made at more than \$3.25. The latter price is more representative of present possibilities in this district and there are reports from well-informed quarters that an order providing a few weeks' run for a battery of ovens could be placed at \$3. Such a price, however, puts a very low appraisal on the value of the coal required and, since the raw coal could be sold at a better price, it is difficult to understand why oven operators should go to the extra trouble and expense of burning the coal. Neither of the two inquiries from the East for fair-sized lots of furnace coke has been closed, but one for seven cars a day from the Robeson Iron Co., to run for at least 60 days, was placed at \$3.75 per net ton oven. This coke was low in phosphorus and commanded a special price on that account. Spot foundry coke still is quotable from \$4.50 per net ton oven for ordinary brands up to \$5 and \$5.20 for reputable brands. The coal is dull and weak, due chiefly to the fact that the lake ports have become clogged by heavy shipments and a light movement to the Northwestern ports. All shipments to the lakes are by permit, these being issued by the ore and coal exchange, which in this fashion keeps informed as to the amount of coal moving to the Northwest. Mine run grade of all classes of coal now are available at \$2 per net ton, f.o.b. mines. This is minimum on gas coal, which occasionally sells up to \$2.25, while it is about maximum on steam by-product coal, sales of which recently have been as low as \$1.75.



**Old Material.**—Interest in the market on the part of melters again is at a low ebb and this development finds reflection in a slightly weaker undertone. There has been no change in prices of the heavier lines of open-hearth grades, but dealers are finding some difficulty in obtaining recent prices on such material as turnings and borings. One Pittsburgh district steel company claims to have bought fair sized tonnages of machine shop turnings the past week at \$8.25, and is offering that price on such lots of this grade as are being offered. The best bid on turnings is \$8.50 delivered, but at the moment most dealers are refusing to go below \$9.

We quote for delivery to consumers' mills in the Pittsburgh and other districts taking the Pittsburgh freight rate, as follows:

Heavy melting steel, Steubenville, Follansbee, Brackenridge, Monessen, Midland and Pittsburgh.....	\$13.50 to \$14.00
No. 1 cast cupola sizes.....	18.00 to 18.50
Rerolling rails, Newark and Cambridge, O.; Cumberland, Md.; Huntington, W. Va.; Franklin, Pa., and Pittsburgh .....	15.00 to 16.00
Compressed sheet steel.....	11.00 to 11.50
Bundled sheet sides and ends, f.o.b. consumers' mills, Pittsburgh dist..	9.00 to 9.50
Railroad knuckles and couplers.....	14.50 to 15.00
Railroad coil and leaf springs.....	14.50 to 15.00
Railroad grate bars.....	12.00 to 12.50
Low phosphorus melting stock, bloom and billet ends, heavy plates, 1/4-in. and heavier .....	18.00 to 19.00
Railroad malleable .....	13.00 to 14.00
Iron car axles.....	22.00 to 23.00
Locomotive axles, steel.....	19.00 to 20.00
Steel car axles.....	15.50 to 16.00
Cast iron car wheels.....	15.00 to 16.00
Rolled steel wheels.....	14.50 to 15.00
Machine shop turnings.....	8.50 to 9.00
Sheet bar crop ends at origin.....	14.00 to 15.00
Heavy steel axle turnings.....	11.00 to 11.50
Short shoveling turnings.....	10.00 to 10.50
Heavy breakable cast.....	14.50 to 15.00
Stove plate .....	12.50 to 13.00
Cast iron borings.....	9.50 to 10.00
No. 1 railroad wrought.....	13.00 to 13.50

## EXCHANGE LOWERS PRICES

### German Market Depressed by Rise of Mark— Price Cutting Continues (Special Correspondence)

BERLIN, GERMANY, May 12.—The general feeling of uncertainty prevailing during the past few weeks continues, but there were indications of a steadier undertone in the market. A temporary stiffening was distinctly noticeable and found its reflection in a slight recovery of bar iron prices, but the improvement lasted but a few days, turning out to be merely a stopping place in the downward trend of prices. It is generally conceded that a further drop of the market depends upon the further rise of German exchange. The rapid depreciation of the mark during the past week has already resulted in closing the door to foreign competition. Belgium and Lorraine can not compete within the German borders except at a loss.

Bar iron was quoted around 2000 m. at the beginning of last week, but soon receded to 1800 m., while the latest quotations on hand are 1700 m. to 1750 m. with keen price cutting, especially by merchant firms, a feature of the market. Flat iron sold at 1800 m. Heavy sheets fluctuated with the average price in the neighborhood of 2100 m., the lowest offers named being 1950 m. Medium sheets were offered at 2300 m. Black sheets, box annealed, fetched 2500 to 2900 m., according to gage. Rail prices are fairly firm owing to recent orders by the railroads for a comparatively large tonnage; we quote 2200 m. for rails and 2700 m. for fish plates, per metric ton.

Dullness in the wire market continues despite a fresh cut by the wire association of an average of 63 m. per 100 kilos. Consumers as well as jobbers are standing by and looking on with admirable complacency, everybody being apparently convinced of a further recession of prices. The latest quotations on wire rods are 1700 m. per ton. In the bright line, 3200 m. per ton has been paid for shafts and rounds.

Some of the recent price cuts decided upon by syndicates include ship plates and wrought iron. The Shipbuilding Steel Bureau has met the demands of consumers for a cut by a reduction of prices for plates and structural material from 2930 m. to 2200 m. per ton for a period ending July 1, and made retroactive to April 1. The wrought iron syndicate at Cologne has reduced sales prices for merchant iron from 3800 m. to 3300 m. per ton; for bolts and nuts, press iron, etc., from 3900 m. to 3600 m.; for rivet stock from 4000 m. to 3650 m. per ton, all f.o.b. maker's works.

## British Iron and Steel Market

### Prices Still Falling—Industry Marking Time— Continental Competition Hurts

(By Cable)

LONDON, ENGLAND, May 30.

Traders in iron and steel are awaiting a settlement of the coal issue. If this is reached this week it is anticipated that the colliers will resume operations June 6. But no production of Cleveland iron is expected before July, even if fuel costs induce the iron makers to resume operation.

Official minimum prices are unchanged, but sellers of No. 3 foundry ask £6 10 s. (\$25.22) home and £6 15s. (\$26.19) export. Hematite home demand is stagnant, but there is export inquiry. East Coast mixed numbers are sold for shipment at £7 10s. (\$29.10) f.o.b.

Steel buying for the home trade is in abeyance. Continental makers are securing many export orders. Germany has sold merchant bars to India and China at around £8 5s. (\$32.01) f.o.b.

Tin plates are erratic, August demand being sold at 24½s. (\$4.75) f.o.b., though makers generally demand 26½s. (\$5.14) f.o.b. The United States and Canada are inquiring for oil sizes. Tin plate wages are down to 75 per cent above pre-war levels, being now about one-half of the maximum paid during the boom.

Stocks of galvanized sheets have diminished. Some sellers ask £26 (\$100.88) f.o.b. for 24-gage corrugated sheets, but the general quotation is £22 (\$85.36) f.o.b. Belgium is selling to Japan specifications black sheets at £20 (\$77.60) f.o.b.

We quote per gross ton except where otherwise stated, f.o.b. maker's works, with American equivalent figured at \$3.88 per £1 as follows:

Durham coke .....	\$2 2	\$8.15
Cleveland basic .....	6 0	23.28
Cleveland No. 1 foundry....	6 5	24.25
Cleveland No. 3 foundry....	6 0	23.28
Cleveland No. 4 foundry....	5 19	23.09
Cleveland No. 4 forge.....	5 17½	22.80
East Coast mixed.....	8 0 & £7 10*	31.04 & \$29.10
Perronmanganese .....	18 0 & £7 10*	69.84 & £7.90
Ship plates .....	16 0 to 19 0	62.08 to 73.72
Boiler plates .....	24 0 to 25 0	93.12 to 97.00
Tees .....	15 10 to 18 10	60.14 to 71.78
Channels .....	14 15 to 17 15	57.23 to 68.87
Beams .....	14 10 to 17 10	56.26 to 67.90
Round bars, 3/4 to 3 in....	15 0 to 16 10	58.20 to 64.02
Rails, 60 lb. and up.....	13 0 to 15 0	50.44 to 58.20
Billets .....	11 10 to 12 10	44.62 to 48.50
Sheet and tin plate bars, Welsh .....	11 0 to 11 10	42.68 to 44.62
Galvanized sheets, 24 g....	22 0 to 22 10	85.36 to 87.30
Black sheets .....	19 0 to 20 0	73.72 to 77.60
Tin plate base box.....	1 6 to 1 9	5.04 to 5.63
Steel hoops .....	17 10 to 20 0	67.90 to 77.60

\*Export price.

### Manufactures in United States

Except for the item of Slaughtering and Meat Packing, which accounted for \$3,714,340,000 in 1919, the product of Steel Works and Rolling Mills, with \$2,812,775,000, was the heaviest reported by the Census Bureau. Automobiles, with \$2,387,833,000, and Foundry and Machine Shop Products, with \$2,321,129,000, were third and fourth, respectively. These four items accounted for 18 per cent of the entire \$62,588,905,000 of output in 1919.

## New York

NEW YORK, May 31.

**Pig Iron.**—The largest inquiry reported is for 1200 tons, half No. 2 plain and half No. 1, which comes from a New Jersey melter. Other inquiries are for very small lots. Salesmen who have covered the New England territory within the past few days report that foundries are operating at about 20 per cent of capacity and many of them are well supplied with pig iron and do not expect to be in the market for months. Some also have piled large quantities of castings. Reports are that very low prices are prevalent, some being attributed to resale transactions, but most of the reports are lacking in confirmation.

We quote delivered in the New York district as follows, having added to furnace prices \$2.52 freight from eastern Pennsylvania, \$5.46 from Buffalo and \$6.16 from Virginia:

East. Pa. No. 1 fdy., sil.	2.75 to 3.25	\$28.52 to \$29.52
East. Pa. No. 2X fdy., sil.	2.25 to 2.75	27.52 to 28.52
East. Pa. No. 2 fdy., sil.	1.75 to 2.25	26.52 to 27.52
Buffalo, sil.	1.75 to 2.25	32.46 to 33.46
No. 2 Virginia, sil.	1.75 to 2.25	31.16 to 32.16

**Ferroalloys.**—The ferromanganese and spiegeleisen markets are at a virtual standstill. There is an inquiry for 500 tons of spiegeleisen which has been before the market for a week or two, but no sales are recorded. It is stated that resale ferromanganese has changed hands around \$78, f.o.b. plant, but quotations from first hands are unchanged. High grade foreign manganese ore is inactive at unchanged quotations. No demand for 50 per cent ferrosilicon is recorded. Quotations are as follows:

Ferromanganese, domestic, delivered, per ton	\$80.00
Ferromanganese, British, seaboard, per ton.	\$75.00
Spiegeleisen, 20 per cent, furnace, per ton.	\$32.00 to \$36.00
Ferrosilicon, 50 per cent, delivered, per ton.	\$80.00
Ferrotungsten, per lb. of contained metal, 48c. to 58c.	
Ferrocromium, 6 to 8 per cent carbon, 60 to 70 per cent Cr., per lb. Cr.	16c. to 16.50c.
Ferrovandium, per lb. of contained vanadium	\$5.00
Ferrocobalt, 15 to 18 per cent, net ton	\$200.00
Ferrocobalt, 15 to 18 per cent, 1 ton to carloads, per ton	\$220.00
Ferrocobalt, 15 to 18 per cent, less than 1 ton, per ton f.o.b. Niagara Falls, N. Y.	\$250.00
Manganese ore, foreign, per unit, seaboard,	25c. to 30c.

**Finished Iron and Steel.**—Signs are multiplying that active competition will mark sizable offerings and that the Steel Corporation will be numbered among those present. The recent purchase of about 1200 tons for locomotives for China appears to have been done at 1.85c., Pittsburgh base, though one bid was at 1.80c., a number at 1.90c. and some at 2.20c. It is admitted that the plate market is soft with transactions so few that it is difficult to name the price basis which could be definitely duplicated on a sizable and attractive order. In the face of a grist of rumors of low quotations, carload lots of structural material and of steel bars have been placed at the market prices subjoined, though rerolled bars are obtainable at a concession. No improvement is noted in the fabricated steel situation. Among new projects may be mentioned 1500 tons for a Chesapeake & Ohio bridge; 500 tons for a bank at Fort Wayne, Ind., and 150 tons for bridge work for the New York Central. One award of the week covers 400 tons for a school building at Manchester, N. H. The number of postponements remain conspicuous. Included among these is a 750-ton bridge for the Central Railroad of New Jersey. Information is not available at this writing of the fresh bids received by the Government for 14 tanks taking 2800 tons. A Masonic temple at Danville, Pa., which would take 700 tons of structural steel, is to be built of reinforced concrete. No decision has been made by the Great Northern Paper Co. on a 600 ton addition at Milinocket, Me.

We quote for mill shipments, New York, as follows: Soft steel bars, 2.48c.; plates and structural shapes, 2.58c.; bar iron, 2.28c.

**Warehouse Business.**—Warehouses report the dullness of the market more intense the past week than at any time this year. While prices are generally

unchanged, many quotations are largely nominal, and a fair tonnage would probably bring out lower prices. No. 28 gage galvanized sheets are generally bringing around 6c. per lb., but there are numerous transactions reported at 5.75c. per lb. and it is believed that an inquiry for 100 bundles or more would bring out a price of 5.50c. per lb. We quote prices on page 1520.

**High Speed Steel.**—The market is in much the same situation as other markets. The dullness continues, quotations being nominally from 90c. to \$1 per lb. for 18 per cent tungsten high speed steel.

**Cast Iron Pipe.**—Though no new municipal inquiries of consequence have come into the market, the volume of private inquiries and orders remains satisfactory. We quote f.o.b. New York, as follows: 6-in. and larger, \$58.30; 4-in., \$68.30; 3-in., \$78.30, with \$4 additional for Class A and gas pipe.

**Old Material.**—An indication of dullness is the fact that dealers are receiving but few calls from brokers with intent to buy. Three eastern Pennsylvania mills are buying small quantities of heavy melting steel, paying no more than the equivalent of \$7.50, New York. There is also some demand for pipe, borings and turnings and stove plate, the last being rather scarce. Prices are practically unchanged.

Buying prices per gross ton, New York, follow:

Heavy melting steel	\$7.00 to \$7.50
Rerolling rails	9.50 to 10.00
Relaying rails, nominal	40.00 to 42.50
Steel car axles	10.50 to 11.50
Iron car axles	17.00 to 18.00
No. 1 railroad wrought	10.00 to 11.00
Wrought iron track	7.25 to 7.50
Forge fire	5.00 to 6.00
No. 1 yard wrought, long	8.00 to 9.00
Light iron	2.00 to 3.00
Cast borings (clean)	4.00 to 4.50
Machine-shop turnings	3.00 to 4.00
Mixed borings and turnings	3.00 to 3.50
Iron and steel pipe (1 in. diam., not under 2 ft. long)	8.00 to 8.50
Stove plate	9.00 to 9.50
Locomotive grate bars	8.50 to 9.00
Malleable cast (railroad)	8.00 to 8.50
Old car wheels	13.00 to 13.50

Prices which dealers in New York and Brooklyn are quoting to local foundries, per gross ton, follow:

No. 1 machinery cast	\$16.00 to \$17.00
No. 1 heavy cast (columns, building materials, etc.), cupola size	15.00 to 16.00
No. 1 heavy cast, not cupola size	10.00 to 11.00
No. 2 cast (radiators, cast boilers, etc.)	10.00 to 11.00

## Birmingham

BIRMINGHAM, ALA., May 31.

**Pig Iron.**—The last week in May was an extremely dull one for iron. Lots of 500 and 100 tons by different makers for Southern delivery were sold at \$22.50. Real tonnage can be placed at \$22. The usual carload brings \$23. Business consists principally of prompt order small lots, but even that aggregate was smaller than usual. Inquiry is much brisker. Additional foundries find themselves out of iron, but order only what is needed now. Two makers shipped a furnace make last month. Stocks of foundry will be about the same as in May. Railroads are trying to get some Pacific Coast business in pipe, iron and billets that has gone through the canal via Mobile. The rate on pig iron has been reduced from \$1 to 90c., on billets from \$1.50 to \$1.05 and on cast iron pipe from \$1.50 to \$1.05 in minimum lots of 60,000 pounds and \$1.25 on minimum lots of 40,000 pounds. The average rate on pipe via canal and Mobile is \$16. The cut proposed by the railroads still leaves a considerable margin in favor of water route.

We quote per gross ton f.o.b. Birmingham district furnace, as follows:

Foundry, sil. 1.75 to 2.25	\$22.00
Basic	21.00
Charcoal	35.00

**Cast Iron Pipe.**—The actual selling base on high pressure pipe is \$45 to \$48. The National Pipe Co., which secured Akron's 950 tons on a bid of \$45 for 16-in., booked several additional orders the past week, a total of 1000 tons. General business is small. Phoenix, Ariz., had closed for 6000 tons, but could not stand the



freight rate of \$30, hence cancelled the order. Soil pipe base has been reduced from \$45 to \$40. Central Foundry Co. has resumed at its Anniston shop. Yard stocks are unusually large and competition active.

**Old Material.**—The scrap market is as listless as the iron market. A minimum of transactions at the new low prices goes on.

We quote per gross ton f.o.b. Birmingham district yard as follows:

Old steel rails.....	\$10.00 to \$11.00
No. 1 steel.....	9.00 to 10.00
No. 1 cast.....	16.00 to 17.00
Car wheels.....	16.00 to 17.00
Tramcar wheels.....	15.00 to 16.00
No. 1 wrought.....	13.00 to 14.00
Stove plate.....	9.00 to 10.00
Cast iron borings.....	6.00 to 7.00
Machine shop turnings.....	6.00 to 7.00

## Cincinnati

CINCINNATI, May 31.

**Pig Iron.**—Sales during the week with one or two exceptions have been for carload lots for immediate shipment. A Springfield, Ohio, melter is reported to have closed for 400 tons of foundry iron at around \$24 delivered, the business going to a lake furnace. A southern Ohio melter bought 100 tons of Northern iron at around \$25.50 delivered, the iron supposedly coming from the Chicago district. An Indiana melter took 100 tons of Southern iron on the basis of \$22.50 Birmingham. Several sales of carloads of ferromanganese and spiegeleisen are also reported. The market is practically devoid of inquiry, though an Indiana melter is inquiring for 300 tons for second half shipment. Prices, with the exception of Jackson County silveries, which have been cut \$3 a ton, are unchanged. Southern Ohio iron is quoted at \$24 Ironton, Southern iron at \$22 Birmingham and basic and malleable at \$23 and \$24 respectively. Shipments from furnaces in this district during May were the largest of any month this year, but the prospects for June are not so bright.

Based on freight rates of \$4.50 from Birmingham and \$2.52 from Ironton, we quote f.o.b. Cincinnati:

Southern coke, sil. 1.75 to 2.25 (base)	\$26.50
Southern coke, sil. 2.25 to 2.75 (No. 2 soft)	27.50
Ohio silvery, 8 per cent sil.	38.02
Southern Ohio coke, sil. 1.75 to 2.25 (No. 2)	26.52
Basic, Northern	25.52
Malleable	26.52

**Coke.**—The coke market is very quiet, though we note a sale of 10 carloads to a melter in this district. Prices are unchanged.

**Finished Material.**—Inquiry for finished material is still extremely light, carload business for prompt shipment being the predominating activity. There has been, however, some interest shown in concrete reinforcing bars and light rails from mining companies. On reinforcing bars, quotations of 1.90c. have been made on bars rolled from old rails, but on new bars the full price of 2.10c. is being firmly held. The prevailing quotation on light rails is around 2.10c., Pittsburgh. The market for plates and shapes is quiet. Reports are heard of galvanized sheets being offered by brokers at from \$2 to \$4 a ton under mill prices. There is very little activity, however, in the sheet market and the general opinion seems to be that price cutting would not develop any new business. The structural field is very quiet, although the prospects for the future are reported fair. Reports from Columbus, Ohio, indicate that there will probably be about \$30,000,000 worth of new construction placed in that district during the remainder of the year. This includes water-works extensions, street railway improvements, elimination of grade crossings, buildings and stadium for Ohio State University, public schools, and bridges in Franklin County. The Hamilton County (Ohio) commissioners are also contemplating the erection of a new bridge over the Miami River to cost approximately \$150,000. Many of these projects have already been authorized and bonds issued to cover the cost. Plant alterations will not materially change during the week. The Andrews Steel Co. has put on two open-hearth furnaces and the mills are running approximately 50 per cent. A 50 per cent operation is also

being secured in the sheet mills of the Newport Rolling Mill Co. The mills at Middletown and Portsmouth, according to reports, are operating about 45 per cent of capacity.

**Warehouse Business.**—Local warehouses report the market as quiet. A fair number of orders is being received, but the tonnages are very small. A hand to mouth policy is still being pursued by local buyers.

Iron and steel bars, 3.35c. base; hoops and bands, 4.05c. base; shapes, 3.45c. base; plates, 3.45c. base; reinforcing bars, 3.42½c. base; cold rolled rounds, 1½ in. and larger, 4.85c.; under 1½ in. and flats, squares and hexagons, 5.35c.; No. 10 blue annealed sheets, 4.35c.; No. 28 black sheets, 5.50c.; No. 28 galvanized sheets, 6.50c.; wire nails, \$3.60 to \$3.85 per keg base; No. 9 annealed wire, \$3.60 per 100 lb.

**Tool Steel.**—The demand is very light. Prices are unchanged, 18 per cent tungsten high speed steel being quoted at \$1 per lb.

**Old Material.**—Some dealers report the market is picking up slightly. There have been some small inquiries for heavy melting steel and prices are being firmly held. A pipe company in this district was in the market last week for a small tonnage of cast scrap. Local foundries, however, are not showing much interest. Steel mills in this vicinity which have been taking in small quantities have again suspended shipments. The B. & O. Railroad will issue a substantial list next week. The C. & O. closed a list on Saturday and the Big Four will close some time during the week. Prices are unchanged and largely nominal.

We quote dealers' buying prices:

	Per Gross Ton
Bundled sheets.....	\$7.50 to \$8.50
Iron rails.....	16.50 to 17.50
Relaying rails, 50 lb. and up.....	30.50 to 31.50
Re-rolling steel rails.....	11.50 to 12.50
Heavy melting steel.....	10.00 to 11.00
Steel rails for melting.....	10.50 to 11.50
Car wheels.....	14.00 to 15.00

	Per Net Ton
No. 1 railroad wrought.....	10.00 to 11.00
Cast borings.....	5.00 to 5.50
Steel turnings.....	3.50 to 4.00
Railroad cast.....	13.50 to 14.50
No. 1 machinery.....	13.50 to 14.50
Burnt scrap.....	8.00 to 9.00
Iron axles.....	20.00 to 20.50
Locomotive tires (smooth inside).....	10.00 to 11.00
Pipes and flues.....	7.50 to 8.00

## St. Louis

ST. LOUIS, May 31.

**Pig Iron.**—The demand for pig iron has shown no particular change during the past week and there has been no improvement in the tone or quotations. Both sales and melting are at a very low ebb and while the distant future is regarded hopefully, the immediate present is still of the hesitant character that has prevailed in the market for many months. The stove foundries are gradually getting under way, following the settlement of the wage problem, but they are not expected to get into active operation on approximately full capacity much before fall. However, improvement is expected to be noted in this industry beginning with the coming month, even though it be slight. The labor difficulties in the stove foundries have been pretty generally adjusted in the city and surrounding areas in which there are foundries. While No. 2 Southern may be regarded now as practically on a basis of \$22 per ton for 1.75 to 2.25 silicon, it is not selling in competition at this point with the Northern and local irons.

**Coke.**—In foundry coke the situation is naturally controlled by the demand for castings, and in consequence there has been no activity in that market during the recent past. The quotations being made in this section are nominal.

**Finished Iron and Steel.**—Finished products show about the same conditions as have prevailed recently although the warehouses continue to report a slightly increasing volume of deliveries.

For stock out of warehouse we quote as follows: Soft steel bars, 3.22½c.; iron bars, 3.22½c.; structural material, 3.32½c.; tank plate, 3.32½c.; No. 10 blue annealed sheets, 4.22½c.; No. 28 black sheets, cold rolled, one pass, 5.50c.; No. 28 galvanized sheets, black sheet gage, 6.50c.

**Old Material.**—The scrap market shows no abatement of the dullness which has prevailed for so long and the prices that are quoted herewith cannot be ac-

cepted as based on actual transactions, for there have been none of sufficient weight to justify the statement that the figures represent actual business and a real market under existing circumstances. They can be estimates of value only and are probably above the prices at which scrap would sell if any business appeared. The end of the month and the holiday added to the indifference as to the market, and as the railroad lists will not come out until the last of this week and the first of next, there is no way to determine figures even on the basis of what dealers will pay to lay down in their yards.

We quote dealers' prices f.o.b. consumers' works, St. Louis industrial district, as follows:

Per Gross Ton	
Iron rails .....	\$13.00 to \$13.50
Steel rails, rerolling.....	12.50 to 13.00
Steel rails, less than 3 ft.....	12.00 to 12.50
Relaying rails, standard section, subject to inspection.....	27.50 to 32.50
Car wheels .....	12.50 to 13.00
No. 1 railroad heavy melting steel.....	12.00 to 12.50
Heavy shoveling steel.....	10.50 to 11.00
Ordinary shoveling steel.....	10.00 to 10.50
Frogs, switches and guards cut apart.....	12.00 to 12.50
Ordinary bundled sheet.....	5.00 to 5.50
Per Net Ton	
Heavy axle and tire turnings.....	5.00 to 5.50
Iron angle bars.....	10.50 to 11.00
Steel angle bars.....	10.25 to 10.75
Iron car axles.....	20.50 to 21.00
Steel car axles.....	14.00 to 14.50
Wrought arch bars and transoms.....	14.00 to 14.50
No. 1 railroad wrought.....	10.50 to 11.00
No. 2 railroad wrought.....	9.50 to 10.00
Railroad springs.....	10.50 to 11.00
Steel couplers and knuckles.....	10.50 to 11.00
Locomotive tires, 42 in. and over, smooth inside .....	9.00 to 9.50
No. 1 dealers' forge.....	7.00 to 7.50
Cast iron borings.....	6.50 to 7.00
No. 1 busheling.....	10.50 to 11.00
No. 1 boilers, cut to sheets and rings.....	6.00 to 6.50
No. 1 railroad cast.....	12.00 to 12.50
Stove plate and light cast.....	11.00 to 11.50
Railroad malleable .....	9.50 to 10.00
Agricultural malleable .....	10.00 to 10.50
Pipes and flues.....	7.00 to 7.50
Railroad sheet and tank.....	5.00 to 5.50
Railroad grate bars.....	7.00 to 7.50
Machine shop turnings.....	5.00 to 5.50
Country mixed .....	7.00 to 7.50
Uncut railroad mixed.....	8.00 to 8.50
Horseshoes .....	11.00 to 11.50
Railroad brake shoes.....	8.00 to 8.50

## Buffalo

BUFFALO, May 31.

**Pig Iron.**—Opinion is general that better business is in sight. Two interests find shipping on old contracts considerably improved and the month of May will show a greater tonnage on old contracts than any month this year. An export inquiry of 1500 tons of foundry iron is in the hands of one producer, but it is not expected the order will be placed here, the belief being that some foreign furnace will get the business. Resale is still a factor and in most instances is offered by brokers and small foundries which find themselves overloaded with no likelihood of increasing operation. The frequency of this business has a bearing on prices which is displeasing to furnace interests. Inquiry has fallen off with one producer, but sales are better. About 500 tons was sold at \$25 and \$26 base. A small tonnage of malleable was sold by the same maker for \$24. One furnace finds increasing activity with small foundries which have lately resumed. Sales with this interest continue about the same but there is a growing number of buyers active. May, with this interest, has also shown improved shipping over previous months.

We quote f.o.b. dealers' asking prices per gross ton Buffalo as follows:

No. 1 foundry, 2.75 to 3.25 sil.....	\$26.00 to \$27.00
No. 2X foundry, 2.25 to 2.75 sil.....	25.00 to 26.00
No. 2 plain, 1.75 to 2.25 sil.....	24.00 to 25.00
Basic (nominal) .....	23.00 to 24.00
Malleable nominal .....	24.00 to 25.00
Lake Superior charcoal.....	38.00

**Coke.**—Demand is slightly improved but individual orders are for carload lots. The best grades are bringing from \$5 to \$6.

**Finished Iron and Steel.**—June will see increased operation by several local mills; one maker will be at 50 per cent of normal operation and on the basis of demand and inquiry indicated last week, expects to con-

tinue operations without reduction. One mill finds its largest business is in bars, reinforcing material being fairly active. Better demand for structural shapes and plates also marked the week. One sales office attributes poor business last week to a growing belief that price reductions are imminent. The greatest activity is in tubular products and structural shapes, this office finds. Tin plate demand has fallen off because of decreased operation among canners.

We quote warehouse prices f.o.b. Buffalo as follows: Structural shapes, 3.25c.; plates, 3.25c.; plates, No. 8 gage, 4.10c.; soft steel bars and shapes, 3.15c.; hoops, 3.85c.; blue annealed sheets, No. 10 gage, 4.15c.; galvanized steel sheets, No. 28 gage, 6.30c.; black sheets, No. 28 gage, 5.30c.; No. 8 gage annealed wire, 4.35c.; cold rolled strip steel, 8.15c.

**Old Material.**—The only activity is in the efforts of a few dealers to buy heavy melting steel at a price which will enable them to turn it over for \$13. This is difficult as the \$13 price is firm. No activity is noted in any other commodity.

We quote dealers' asking prices per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel.....	\$12.50 to \$13.00
Hydraulic compressed .....	9.00 to 9.50
Low phos., 0.04 and under.....	17.00 to 18.00
No. 1 railroad wrought.....	13.00 to 14.00
Car wheels .....	16.00 to 17.00
Railroad malleable .....	11.50 to 12.50
Machine shop turnings.....	7.00 to 8.00
Heavy axle turnings.....	10.00 to 11.00
Clean cast borings.....	7.00 to 8.00
Locomotive grate bars.....	11.50 to 12.50
Wrought pipe .....	9.50 to 10.50
No. 1 busheling.....	9.50 to 10.50
Stove plate .....	15.00 to 16.00
Bundled sheet stampings.....	7.00 to 8.00
No. 1 machinery cast.....	18.00 to 18.50

## Boston

BOSTON, May 31.

**Pig Iron.**—New Sloss-Sheffield Alabama prices are announced with silicon 1.75 to 2.25 at \$22.50 furnace and 50c. differentials on each higher silicon content. A No. 1 X iron, therefore, is \$23.50 furnace or \$34.17 delivered all-rail New England points and \$32.57 to \$32.84 at Eastern water competitive points. No sales are reported at the new schedule nor has Buffalo iron sold since last reports. Virginia iron prices appear softer although but one car No. 2 X resale changed hands, going to a Rhode Island foundry at \$30 delivered, which with \$1 differentials figures out less than \$22.50 for silicon 1.75 to 2.25 furnace. All other sales concern eastern Pennsylvania and include 100 tons No. 2 X resale to a Massachusetts melter at \$30.10 delivered, two cars No. 2 X to a New Hampshire foundry, one at \$26 furnace and the other at slightly better than \$25, and one car of silicon 2.75 to 3.25 to a nearby consumer at \$31.31 delivered, or about \$25.25 furnace for No. 2 plain. Delivered prices follow:

East. Penn., sil. 2.25 to 2.75.....	\$28.56 to \$29.06
East. Penn., sil. 1.75 to 2.25.....	27.56 to 28.06
Buffalo, sil. 2.25 to 2.75.....	30.46 to 34.71
Buffalo, sil. 1.75 to 2.25.....	29.46 to 33.46
Virginia, sil. 2.25 to 2.75.....	31.58 to 32.83
Virginia, sil. 1.75 to 2.25.....	30.58 to 31.58
Alabama, sil. 2.25 to 2.75.....	33.66 to 34.66
Alabama, sil. 1.75 to 2.25.....	33.16 to 34.16

**Warehouse Business.**—Competition for business is growing keener and sales for the week are slightly larger. One house is credited with offering concessions on iron and steel, but the others are maintaining prices. Local stocks are ample for requirements. The demand for bolts and nuts covers a wider range of product than heretofore. Cut nails have been reduced 25c. per cask to \$6.75 base. Demand for wire nails is better and stocks badly broken, but jobbers are in no hurry to purchase as they expect lower prices.

**Coke.**—Consumption of foundry coke throughout New England apparently does not vary much. Gains made by certain foundries are offset in other plants. Going business is confined to an occasional new order for car lots and releases on contract. Both the New England Coal & Coke Co. and the Providence Gas Co. continue to quote spot coke at \$11.66 delivered where the local freight does not exceed \$3.40 and contract coke at \$11.41. There is not enough doing in Connells-vill foundry coke to constitute a market.

**Finished Material.**—The Eastern Massachusetts Street Railway Co. is inquiring on 500 tons girder rails



and there is a 100-ton open hearth rail inquiry in the market. The Great Northern Paper Co., Millinocket, Me., has received bids on 600 tons structural steel for a power house addition, and Smith College, Northampton, Mass., for about 100 tons for a dormitory. A 200-ton inquiry features the plate market. Boiler makers, based on present activities, have sufficient stock to last four to six months. Aggregate tonnages of reinforcing bar business prospects are larger, but consumers are slow in closing. Small tonnages of merchant bars can be had at the same price as quoted on large, namely 2.10c., Pittsburgh. One New England maker of bolts and nuts is credited with cutting prices. Small interests offer odd sizes of wire nails at concessions.

Jobbers now quote: Soft steel bars, \$3.18 per 100 lb. base; flats, \$4.18 to \$4.28; concrete bars, \$3.18 to \$3.45½; tire steel, \$4.25 to \$4.75; spring steel, open hearth, \$5.50; crucible, \$11.50; steel bands, \$3.83 to \$4.48; steel hoops, \$4.38; toe rail steel, \$5.25; cold rolled steel, \$4.65 to \$5.15; structural, \$3.18 to \$3.28; plates, \$3.28 to \$3.50; No. 10 blue annealed sheets, \$4.53; No. 28 black sheets, \$5.85; No. 28 galvanized sheets, \$6.85; refined iron, \$3.18 to \$5; best refined, \$5; Wayne iron, \$8.50; Norway iron, round, ¼-in. to 2½-in., 8c. per lb. net; other sizes, 10c. base.

**Old Material.**—The market for machinery cast is more active, but only slightly so. Sales for the week include one 200-ton and one 100-ton lots No. 1 selected at 1c. per lb. delivered or \$22.40, an exceptionally high price, and several car lots at \$18 and \$18.50 delivered, mostly to eastern Massachusetts and Rhode Island consumers. The Bethlehem Steel Co. is reported as in the market for heavy melting steel at \$11 delivered, another eastern Pennsylvania mill at \$11.50 and Midvale at \$12, but holders are not anxious to sell at these prices. The Champion Horseshoe Co., Pawtucket, R. I., is credited with purchasing a tonnage of railroad wrought on a basis of \$11 to \$12 on cars Boston, otherwise business is confined to dealers. A small tonnage of car wheels sold at \$19 delivered. The demand for and offerings of borings and turnings have dropped to a low point and prices are largely nominal.

The following prices are for gross ton lots delivered consuming points:

No. 1 machinery cast.....	\$18.00 to \$19.00
No. 2 machinery cast.....	17.00 to 17.50
Stove plate .....	15.50 to 16.00
Railroad malleable .....	15.00 to 15.50

The following prices are offered per gross ton lots f.o.b. Boston rate shipping points:

No. 1 heavy melting steel.....	\$7.00 to \$7.50
No. 1 railroad wrought.....	10.50 to 11.00
No. 1 yard wrought.....	9.00 to 9.50
Wrought pipe (1-in. in diameter, over 2 ft. long).....	7.00 to 7.50
Machine shop turnings.....	3.00
Cast iron borings, rolling mill.....	3.50 to 4.00
Cast iron borings, chemical.....	3.50 to 4.00
Blast furnace borings and turnings.....	3.00
Forged scrap and bundled skeleton.....	4.00 to 4.50
Street car axles and shafting.....	11.50 to 12.00
Car wheels .....	11.50 to 12.00
Rerolling rails .....	9.00 to 10.00

## Philadelphia

PHILADELPHIA, May 31.

In the local iron and steel market, the past week has been merely a repetition of preceding weeks; if there has been any change, it is in the direction of more pronounced dullness. In all branches of the industry the demand for materials is so small that it becomes a source of wonder that consumers can get along with so little, even taking into consideration the low rate at which metalworking plants are operating.

The only noteworthy transaction of the week was the purchase by the Pennsylvania Railroad of 290,000 tie plates, totaling about 1800 tons, on which action had been pending for some months. The order went to an Eastern steel company.

**Pig Iron.**—The market continues very weak, with decided irregularity in prices. Prices for shipment in the eastern Pennsylvania district are apparently slightly higher than for shipment to the New York or New England districts, as in the latter cases the furnaces must allow for higher freight rates, thereby making lower prices f.o.b. furnace. For example, it is admitted that \$23, furnace, has been done on No. 2 plain iron on shipments bearing a high freight rate, whereas \$24, furnace, would be quoted on shipments into this immediate district. Another example is that \$25, furnace, has been quoted by the same furnace on

No. 2X iron and No. 1X, though ordinarily the latter grade would sell for at least \$1 a ton more. Some consumers have stated that they can buy eastern Pennsylvania No. 2 plain iron for \$22, furnace, but no sales are reported on this basis. Furnace quotations of the past week have varied from \$23 to \$24, furnace, on No. 2 plain; \$24 to \$25, furnace, on No. 2X, and \$25 to \$26, furnace, on No. 1X. There is nothing to test the price of basic iron, but it is intimated that a fair-sized inquiry would find furnaces willing to sell at \$23, furnace.

The following quotations are, with the exception of those on low phosphorus iron, for delivery at Philadelphia, and include freight rates varying from 84 cents to \$1.54 per gross ton:

East. Pa. No. 2 plain, 1.75 to 2.25...	\$24.75 to \$25.25
East. Pa. No. 2X, 2.25 to 2.75 sil....	25.50 to 26.25
Virginia No. 2 plain, 1.75 to 2.25 sil....	31.74
Virginia No. 2X, 2.25 to 2.75 sil....	32.99
Basic deliv. Eastern Pa.....	25.00
Gray forge .....	25.26
Standard low phos. (f.o.b. furnace)...	38.00
Malleable .....	28.00 to 29.00
Copper bearing low phos. (f.o.b. furnace) .....	35.00

**Ferroalloys.**—Reports of sales of ferromanganese at \$80 and under are heard, though Eastern producers hold to a nominal price of \$85, delivered. No inquiry for spiegeleisen is noted here.

**Semi-Finished Steel.**—There is no inquiry for billets, which are quoted at \$37, Pittsburgh, for rerolling quality, and \$42, Pittsburgh, for forging quality.

**Plates.**—The efforts of some Eastern mills to stir up business by price cuts have not been wholly successful, as the orders available are still very few and for small quantities. While the market may now be quoted at 2c. to 2.20c., Pittsburgh, it is probable that even the lower price could be shaded if a desirable tonnage were offered. It has been definitely established that a recent order for 1000 tons for a locomotive company was taken by an Eastern mill at 1.85c., Pittsburgh.

**Structural Material.**—There is little to test the market on shapes, but it is persistently reported that one Eastern mill has taken orders at 2c., Pittsburgh. Apparently all others are quoting 2.20c. The continuance of the strike in the local building trades tends to restrict inquiries for steel buildings.

**Sheets.**—Though blue annealed sheets seem to be firm at 3.10c., Pittsburgh, there are reports of shading on black and galvanized.

**Bars.**—The recent reduction on bar iron from 2c. to 1.90c., Pittsburgh, brought out a number of orders, but the demand has dropped almost to nothing again. There is no improvement in the demand for steel bars, which seem firm at 2.10c., with the exception of concrete reinforcing bars, which may be had at lower prices.

**Old Material.**—The market continues quiet, but a better tone prevails, due to the conviction among dealers that prices are on the bottom and that any demand of consequence will force them upward. We quote for delivery at consuming points in this district as follows:

No. 1 heavy melting steel.....	\$12.00 to \$12.50
Steel rails, rerolling.....	15.00 to 15.50
No. 1 low phos., heavy 0.04 and under	17.00 to 18.00
Car wheels .....	18.00 to 19.00
No. 1 railroad wrought.....	15.00 to 16.00
No. 1 yard wrought.....	14.00 to 15.00
No. 1 forge fire .....	10.50 to 11.00
Bundled skeleton .....	8.00 to 8.50
No. 1 busheling.....	12.00 to 13.00
No. 2 busheling.....	10.00 to 11.00
Turnings (short shoveling grade for blast furnace use).....	8.00 to 8.50
Mixed borings and turnings (for blast furnace use).....	7.50 to 8.00
Machine-shop turnings (for rolling mill and steel works use).....	8.50 to 9.00
Heavy axle turnings (or equivalent)	10.00 to 11.00
Cast borings (for rolling mills)....	9.50 to 10.00
Cast borings (for chemical plants)...	10.50 to 11.50
No. 1 cast.....	18.00 to 19.00
Railroad grate bars.....	13.00 to 13.50
Stove plate (for steel plant use)....	13.00 to 13.50
Railroad malleable .....	15.50 to 16.50
Wrought iron and soft steel pipes and tubes (new specifications)....	13.00 to 13.50
Iron car axles.....	No market
Steel car axles.....	No market

**Warehouse Business.**—The following new schedule of warehouse prices has been adopted, which includes reduction on a few items. The prices quoted are for

delivery in Philadelphia; for shipment outside of Philadelphia reductions of from \$2 per ton and up, depending on the grade of steel, are granted to offset transportation costs.

Soft steel bars and small shapes, 3.20c.; iron bars (except bands), 3.20c.; round edge iron, 3.50c.; round edge steel, iron finish, 1½ in. x ½ in., 3.50c.; round edge steel, planished, 4.25c.; tank steel plates, ¼-in. and heavier, 3.30c.; tank steel plates, 3/16-in., 3.52c.; blue annealed steel sheets, No. 10 gage, 4.20c.; light black steel sheets, No. 28 gage, 5c.; galvanized sheets, No. 28 gage, 6c.; square twisted and deformed steel bars, 3.20c.; structural shapes, 3.30c.; diamond pattern plates, ¼-in., 5.05c.; 3/16-in., 5.27c.; ½-in., 5.37c.; spring steel, 5c.; round cold-rolled steel, 4.60c.; squares and hexagons, cold-rolled steel, 5.10c.; steel hoops, No. 13 gage and lighter, 3.85c.; steel bands, No. 12 gage to 3/16-in. inclusive, 3.85c.; iron bands, 4.50c.; rails, 3.20c.; tool steel, 12c.; Norway iron, 8c.; toe steel, 4.50c.

## San Francisco

SAN FRANCISCO, May 25.

**Pig Iron.**—Activity in the Coast market has fallen off during the past week and at present conditions are unusually quiet. Interest in the various foreign offerings has been suspended and practically no sales of consequence are to be reported. One inquiry from the South for about 500 tons of pig iron has not yet resulted in actual business. The wide range in prices of Belgian and Chinese material persists and it is difficult to estimate the market precisely, but offerings range from something under \$30, ex ship, for low grade Belgian to around \$35 for good Hangyang, with the best quality considerably higher.

**Cast Iron Pipe.**—Business has been rather quiet of late, with municipal inquiries scattered and private operations inconsequential. The base is still \$55. Among the few prospects is one from Santa Barbara, which receives bids on May 27 for 156 tons of 12-in. pipe; 79 tons of 8-in. and 8 tons of 6-in. The Sacramento Filtration Division calls bids on May 26 for a quantity of cast iron pipe, flange and bell, spigot pipe and fittings.

**Finished Iron and Steel.**—The situation in San Francisco and environs is almost entirely at a standstill, especially in connection with construction work. The active opposition of the building trades' union to a wage reduction of 7½ per cent has suspended activities generally, and it is estimated that about 600 contractors and 17,000 men of the Bay district are idle at present. Under these conditions the steel market is very quiet, with just a routine volume of business being done. The Columbia Steel Co. reports a falling off of inquiries recently, with prices on reinforcing bars still ruling at \$2.35 mill, California. Other interests have been doing practically nothing. The export market continues dull. There are, however, prospects for the near future that promise better things for the steel business as soon as the strike is lifted. Together with some bridge construction work in the State, several theater jobs are pending, one in both San Francisco and Oakland involving over \$6,000,000. The Southern Pacific Co. is expecting to erect a station in Oakland. A reduction in the price of cement has already been made, which probably will contribute to encourage building construction.

**Coke.**—A few offerings of foreign coke, from Australia, Great Britain and Belgium especially, have been received, but under prevailing conditions, little buying interest has been shown, since prices are considered too high. There are no indications that point to a resumption of business in the immediate future, foundries still being well supplied and operating in a very limited way.

**Old Material.**—A softening tendency has developed in values, since at prices ruling a short time ago there was practically no business. Even at concessions, buying continues in small volume. It was reported that one sale of heavy melting steel was consummated at around \$10 gross ton delivered at the mill, while cast iron scrap has been quoted by dealers at about \$25.

The United Broach & Machine Co., Detroit, has increased its capitalization from \$50,000 to \$100,000.

## Cleveland

CLEVELAND, May 31.

**Iron Ore.**—The amount of Lake Superior ore on docks and in furnace yards is more than 50 per cent larger than at this time a year ago. Figures just compiled by the Lake Superior Iron Ore Association show that the ore on docks and in furnace yards May 1 was 27,600,000 gross tons as compared with 18,150,000 tons on the same day a year ago. Deducting approximately 8,000,000 tons of ore on Lake Erie docks May 1, there was over 19,500,000 tons of lake ore in furnace yards May 1. The April consumption of lake ore was 1,675,000 tons as compared with 4,000,000 during April, 1920.

We quote delivered lower lake ports: Old range Bessemer, \$7.45; old range non-Bessemer, \$6.70; Mesabi Bessemer, \$7.20; Mesabi non-Bessemer, \$6.55.

**Pig Iron.**—Sales are light and the market is weak. Orders for foundry iron placed during the week were mostly at \$23 for No. 2 and higher quotations have about disappeared. An inquiry from the American Radiator Co. for 350 tons of foundry iron for its Springfield, Ohio, plant brought out a quotation below \$23, the low price evidently not having been named by a lake furnace. The same consumer is inquiring for 200 tons for its Titusville, Pa., plant. Other inquiries pending include one from Barberton, Ohio, for 500 tons and one from an Akron, Ohio, furnace manufacturer for 200 tons of No. 2 foundry for prompt shipment. One Cleveland interest reports sales during the week aggregating 1200 tons in small lots. Locally there is no demand for foundry iron and local prices have declined 50c. While there have been no sales to establish the basic iron market, it is understood that basic can be bought freely at \$21.50.

We quote delivered Cleveland as follows, based on the new freight rate, there being a 56c. switching charge for local iron, a \$1.96 freight rate from Valley points, a \$3.36 rate from Jackson and \$6.67 from Birmingham:

Basic .....	\$23.46
Northern No. 2 fdy., sil. 1.75 to 2.25.....	\$24.50 to 25.00
Southern fdy., sil. 2.25 to 2.75.....	29.92
Ohio silvery, sil. 8 per cent.....	38.86
Standard low phos., Valley furnace..	40.00

**Finished Iron and Steel.**—Demand for finished steel is inactive and reports of price concessions have appeared. These indicate that small lot sales of steel bars and plates have been made in some cases at 2c. and there are also reports that extras are being waived on soft steel reinforcing bars. However, most mills are adhering to regular prices. The contract for the Baldwin reservoir, Cleveland, requiring 1700 tons of soft steel reinforcing bars, has been placed with the Hunkin-Conkey Construction Co., but the steel may not be purchased for some time. An Eastern mill is now quoting plates at 2.20c., Pittsburgh, for Western shipment. Inquiry for structural material shows an improvement. The Wisconsin Bridge Co. was low bidder for the Belle Isle bridge, Detroit, requiring 3050 tons, its bid being \$114 per ton erected. A gun handling crane, for which the Navy Department has received bids, will require 800 tons. The stadium to be erected by the Ohio State University, Columbus, will require about 2500 tons of structural material and a round tonnage of reinforcing bars. New inquiries include a bridge for the Chesapeake & Ohio Railroad at Covington, Ky., 1500 tons; building for the First National Bank, Fort Wayne, Ind., 1000 tons; building for the Cleveland Trust Co., 500 tons. With nails more generally quoted at 3c. it is intimated that wire can be bought at 2.75c. Alloy steel is very weak and quotations as low as 4.05c. have been made for 3½ per cent nickel steel. Warehouse business has improved somewhat, indicating that consumers' stocks are getting low.

Cleveland warehouses quote steel bars and small shapes at 2.99c.; plates, 3.09c.; structural shapes, 3.09c.; No. 9 galvanized wire, 4.45c.; No. 9 annealed wire, 3.75c.; No. 28 black sheets, 4.80c.; No. 28 galvanized, 5.70c.; No. 10 blue annealed, 3.85c. to 4c.; hoops and bands, 3.69c.; shafting, 4.25c.

**Coke.**—Foundries are buying coke in car lots as needed, sales being made at \$5.25 to \$5.50 for the



better Connellsville brands. Car lot sales of Virginia and by-product coke are reported at \$8.

**Sheets.**—A Detroit automobile parts manufacturer has placed 200 tons of black sheets, but some other makers of automobile parts have held up shipments. Galvanized sheets are being shaded \$1 to \$2 a ton. Prices on other grades are apparently holding well.

**Bolts, Nuts and Rivets.**—Orders are not of sufficient size to test the market and prices are being maintained. An inquiry has come out for 3500 to 4000 tons of 3½ per cent nickel steel bolts for the New York vehicular tunnel, but this inquiry is apparently only for estimating purposes. Rivet prices are weak. Quotations of 3.15c. on structural and 3.25c. on boiler rivets are being made and there are reports of still lower prices. Some makers report a slight improvement in orders, but consumers are buying only what they actually need.

**Old Material.**—Prices are weaker on cast iron borings, mixed borings and short turnings now that the local consumer who recently purchased considerable scrap in these grades is out of the market. Dealers who have been paying \$8.25 for these grades are now offering only \$7.50 to \$8. Local mills are accepting no shipments of heavy melting steel. Dealers are offering \$10.75 to \$11.50 for heavy melting steel and \$5.50 to \$6 for machine shop turnings. A Valley consumer offered \$12.50 for 1000 tons of heavy melting steel, but this price did not interest the local trade. Cast scrap has declined about \$1 a ton. If dealers are buying scrap for yard stocks instead of for filling old orders they are offering very low prices, that are not bringing out much material.

We quote per gross ton delivered consumers' yards in Cleveland and vicinity as follows:

Heavy melting steel.....	\$11.50 to \$12.00
Steel rails under 3 ft.....	13.50 to 14.00
Steel rails, rerolling.....	15.00 to 16.00
Iron rails.....	13.00 to 14.00
Iron car axles.....	20.00 to 21.00
Low phosphorus melting scrap.....	14.00 to 15.00
Cast borings.....	8.00 to 8.25
Machine shop turnings.....	6.50 to 7.00
Mixed borings and short turnings.....	8.00 to 8.25
Compressed steel.....	10.00 to 10.50
Railroad wrought.....	12.00 to 13.00
Railroad malleable.....	13.00 to 14.00
Light bundled sheet stampings.....	5.00 to 6.00
Steel axle turnings.....	10.00 to 10.50
No. 1 cast.....	17.00 to 17.50
No. 1 busheling.....	7.50 to 8.00
Drop forge flashings, over 10 in.....	5.50 to 6.00
Drop forge flashings, under 10 in.....	6.00 to 6.50
Railroad grate bars.....	13.50 to 14.00
Stove plate.....	13.50 to 14.00
Pipes and flues.....	7.00 to 8.00

## Chicago

CHICAGO, May 31.

With more or less shading in practically every rolled steel commodity except rails, there is a growing feeling in the market that the confidence of buyers cannot be restored until prices go to a level which is regarded as stable. The matter of costs is not involved in the question, as business taken at the heretofore ruling levels has meant a loss to the mills. Although a further cut in steel prices is now looked for, the gloom of business men is steadily diminishing and the belief is growing that the worst of the depression is over and improvement is in sight. The process of liquidation of labor and commodities is not yet complete, but it is well under way. Adjustment of the railroad situation is still in progress, but the end of the extraordinary retrenchment policy of the carriers is in sight and it is believed that large purchases of material by them will have to be made. In this connection, it is noteworthy that three railroad car repair inquiries have come into the market within the past week.

Cast iron pipe has been reduced by the largest maker to \$45 a ton base, Birmingham, in the hope that municipalities which have deferred buying because of price considerations will now take action. Pig iron has definitely declined to \$22 local furnace for No. 2 foundry.

Mill operations in this district have again declined. The Inland Steel Co. has curtailed its output at Indiana

Harbor to about 25 per cent of normal and has shut down its Chicago Heights hard steel bar mill. The Republic bar iron plant at East Chicago has suspended operations and the Wisconsin Steel Co. has reduced its production to about 20 per cent of capacity. The Illinois Steel Co. remains on a 32 per cent basis and the Interstate Iron & Steel Co. is maintaining about the same rate of operations as a week ago. The Calumet Steel Co. at Chicago Heights shut down last week.

**Pig Iron.**—The leading Northern merchant reports that shipments for the month of May exceeded those of April by 40 per cent. While an improvement is thus shown, current business is far from satisfactory, being confined largely to sales of small tonnages ranging from carloads up to 100 or 200 tons. It has been apparent that the ruling quotations on No. 2 foundry, malleable and basic, are \$22, local furnace, or \$1 below the prices quoted a week ago. Southern furnaces still fail to find a market for iron in this territory. A resale lot of 50 tons of Southern foundry, however, has been sold at \$24.50 flat for silicon, 2.75 to 3.25 per cent. A Southern producer is now offering copper free low phosphorus at \$31, Birmingham, for 1 to 2 per cent silicon and \$32 for 2 to 2.50 per cent silicon, which are equivalent to \$37.67 and \$38.67 delivered, Chicago. These prices are over \$2 lower than any thus far named by producers in other sections of the country.

The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable and steel-making irons, including low phosphorus, which are f.o.b. furnace and do not include a switching charge averaging 70c. per ton:

Lake Superior charcoal, averaging sil.	
1.50, delivered at Chicago.....	\$37.50
Northern coke, No. 1, sil. 2.25 to 2.75.....	22.50
Northern coke foundry, No. 2, sil.	
1.75 to 2.25.....	22.00
Northern high phos.....	23.00
Southern foundry, sil. 1.75 to 2.25.....	28.67
Malleable, not over 2.25 sil.....	22.00
Basic.....	23.00
Low phos. Ohio furnace, sil. 1 to 2	
per cent copper free.....	35.00
Low phos., f.o.b. Birmingham, sil. 1 to	
2 per cent, copper free.....	31.00
Silvery, sil. 8 per cent.....	38.53

**Ferroalloys.**—A decline in ferromanganese is indicated by a sale of 100 tons to a local melter at \$80, freight allowed. Spiegeleisen is now available at as low as \$37 delivered, and a current inquiry for this material calls for 100 tons.

We quote 78 to 82 per cent ferromanganese, \$80 delivered; 50 per cent ferrosilicon, \$80 delivered; spiegeleisen, 18 to 22 per cent, \$37 to \$38 delivered.

**Plates.**—The market is exceedingly quiet and it is problematical what prices might be brought out by an attractive inquiry.

The mill quotation is 2.20c., Pittsburgh, the freight to Chicago being 38c. per 100 lb. Jobbers quote 3.23c. for plates out of stock.

**Structural Material.**—Fabricators are taking business at very low prices and it is in fact doubtful whether figures under those of current bids would be quoted if mill prices were further reduced. Recent fabricating bids indicate an urgent desire to keep shops in operation at least to the extent of retaining the nucleus of a working force, whereas if shops had a fair amount of work ahead, they would not be tempted to sacrifice profits or incur losses. The degree to which fabricators reduce their figures to obtain business is indicated by wide variations in the bids on the Belle Isle bridge, Detroit. The successful bid was \$114.75 a ton erected, whereas the figure named by one of the other fabricators was \$116 a ton delivered.

Recent fabricating awards include:

Belle Isle bridge, Detroit, 3500 tons, to Wisconsin Bridge & Iron Co.  
Five highway bridges, Glenwood, Iowa, 162 tons, to Omaha Structural Steel Co.  
Beaver Reserve Fund Building, Madison, Wis., 108 tons, to Worden-Allen Co.  
Edward Beck apartment building, Powell, Cal., 150 tons, to Judson Mfg. Co.  
Corn Products Refining Co., buildings Nos. 1 and 2, North Kansas City, Mo., 180 tons to Gage Structural Steel Co. and 70 tons to Christopher & Simpson Iron Works.

Inquiries include:

First National Bank, Ft. Wayne, Ind., 1500 tons.  
Board of Education, Chicago, three public schools, 1000 tons.

The mill quotation is 2.20c., Pittsburgh, which takes a freight rate of 38c. per 100 lb. for Chicago delivery. Jobbers quote 3.23c. for materials out of warehouse.

**Bars.**—The market is exceedingly quiet and recent shading by some mills has raised the expectation among buyers of a definite reduction in prices. Bar iron has weakened and is now selling at from 2.25c. to 2.38c., Chicago. Rail carbon steel bar mills in this district are again idle.

Mill prices are: Mild steel bars, 2.10c., Pittsburgh, taking a freight of 38c. per 100 lb.; common bar iron, 2.25c. to 2.38c., Chicago; rail carbon, 2c. to 2.25c., mill or Chicago. Jobbers quote 3.13c. for steel bars out of warehouse. The warehouse quotation on cold-rolled steel bars is 4.63c. for rounds and 50c. extra for flats, squares and hexagons. Jobbers quote hard and medium deformed steel bars at 2.88c. base.

**Wire Products.**—Orders from jobbers are falling off and more is heard of price shading in this territory. At the same time, reports from the South indicate a gradual improvement in business conditions in that section. Ordinarily, the summer season is a dull period in the wire trade, but should the confidence of buyers in the market be restored through reductions in mill prices, activity would start earlier than usual. This is suggested by the fact that neither jobbers nor mills have accumulations of stocks. For mill prices, see finished iron and steel, f.o.b. Pittsburgh, page 1506.

We quote warehouse prices, f.o.b. Chicago: No. 9 and heavier black annealed wire, \$3.88 per hundred pounds; No. 9 and heavier bright basic wire, \$3.98 per hundred pounds; common wire nails, \$3.98 per hundred pounds; cement coated nails, \$3.38 per keg.

**Rails and Track Supplies.**—A southwestern railroad, recently reported in this paragraph as being in the market for 500,000 high carbon, hot-worked tie plates, has placed the order with the leading local interest. In general, there is little new business in track fastenings and accessories, and prices are not uniformly so firm as heretofore.

Standard Bessemer rails, \$45; open-hearth rails, \$47; light rails rolled from new steel, 2.20c. f.o.b. makers' mills. Standard railroad spikes, 3.40c., Pittsburgh; track bolts with square nuts, 4.35c., Pittsburgh; steel tie plates, 2.50c., and steel angle bars, 2.75c., Pittsburgh and Chicago; tie plates, iron, 2.50c. to 3c. f.o.b. makers' mills.

**Bolts and Nuts.**—Inquiry is light and prices are soft, lying somewhere between the discount recently prevailing and the lower ones which were in effect before. Of the automobile companies, only the Ford company continues to buy. For mill prices see finished iron and steel, f.o.b. Pittsburgh, page 1506.

Jobbers quote structural rivets, 4.53c.; boiler rivets, 4.63c.; machine bolts up to  $\frac{3}{4}$  x 4 in., 50 per cent off; larger sizes, 45 off; carriage bolts up to  $\frac{3}{4}$  x 6 in., 40 off; larger sizes, 40 off; hot pressed nuts, square and hexagon tapped, \$2.10 off; blank nuts, \$2.60 off; coach or lag screws, gimlet points, square heads, 50 and 5 per cent off. Quantity extras are unchanged.

**Cast Iron Pipe.**—The United States Cast Iron Pipe & Foundry Co. has reduced prices to \$45, Birmingham, for 6-in. and larger and \$48 for 4-in., and has carried the adjustment through its list of fittings and classes, Class A and gas pipe now taking an extra of \$3 instead of \$4. It will be noted also that the differential between 6-in. and 4-in. has been reduced from \$5 to \$3. The reduction was made by the United States company not because it was warranted by lower costs but in the hope that those cities which have been delaying their purchases on account of prices will now come into the market. Akron, Ohio, took bids last week on 3.2 miles of 48-in. pipe, the bids for the complete job, which included the furnishing and installation of the pipe, ranging from \$295,000 up to \$350,000 for steel pipe to \$450,000 for cast iron pipe.

Recent awards include:

St. Paul, Minn., 492 tons, to American Cast Iron Pipe Co.  
Sauk City, Wis., 500 tons, to American Cast Iron Pipe Co.  
Grand Rapids, Mich., 150 tons, to Lynchburg Foundry Co.  
Kalamazoo, Mich., 150 tons, to Lynchburg Foundry Co.

Prospective business includes:

Detroit, 20,000 tons, date for receipt of bids not yet announced.

We quote per net ton f.o.b. Chicago, ex-war tax as follows: Water pipe, 4-in., \$57.10; 6-in. and above, \$54.10; class A and gas pipe, \$3 extra.

**Railroad Rolling Stock.**—P. C. Morales, superintendent of motive power, and F. Perez, director-general, together with other officials of the Mexican National Railways, are in this country for the purpose of buying rolling stock and shop equipment. Thus far 100 locomotives have been ordered, equally divided between the Baldwin and American companies. The party was in Chicago last week and is now in New York. A number of car repair inquiries appeared in the market last week. The Illinois Central is asking for figures on the repair of 1000 steel gondola cars, the Missouri Pacific on 1000 box and 1000 gondola cars, and the Wabash on 600 steel coal cars. The Great Northern has not yet definitely placed its order for 500 refrigerator cars. The specifications do not call for more than 2500 tons of steel, as the construction of the cars will be largely of wood.

**Old Material.**—Sentiment among sellers is steadily growing less optimistic and this has been reflected in a number of reductions in going quotations. At the same time, several prices quoted last week have been substantiated by purchases made by users. Thus two steel mills bought a few thousand tons of heavy melting at \$12 per gross ton and 500 tons of No. 1 railroad wrought were bought at \$11 per net ton. On the other hand, several purchases by consumers indicate declines, as, for example, 300 tons of No. 1 busheling bought at \$9.50 per net ton, and 500 tons of car wheels bought at \$14.50 per gross ton. Outside of a purchase of about 2000 tons of No. 1 machinery cast, stove plate and brake shoes by a local melter, buying of foundry grades has been at a minimum, no doubt reflecting in a measure the idleness of Chicago union jobbing shops which are shut down on account of a strike. Railroad offerings include the Pennsylvania, Southwestern Region, 4000 tons; the Baltimore & Ohio, 12,000 tons; the Baltimore & Ohio Chicago Terminal, 2000 tons; the New York Central and the Erie, blank lists.

We quote delivery in consumers' yards, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton		
Iron rails	.....	\$17.50 to \$18.00
Relaying rails	.....	30.00 to 35.00
Car wheels	.....	14.00 to 14.50
Steel rails, rerolling	.....	13.50 to 14.00
Steel rails, less than 3 ft.	.....	13.00 to 13.50
Heavy melting steel	.....	11.50 to 12.00
Frogs, switches and guards, cut apart	.....	11.50 to 12.00
Shoveling steel	.....	11.00 to 11.50
Low phos. heavy melting steel	.....	14.00 to 14.50
Drop forge flashings	.....	7.50 to 8.00
Hydraulic compressed sheet	.....	8.00 to 8.50
Axle turnings	.....	8.50 to 9.00
Per Net Ton		
Iron angles and splice bars	.....	15.50 to 16.00
Steel angle bars	.....	11.00 to 11.50
Iron arch bars and transoms	.....	14.50 to 15.00
Iron car axles	.....	20.50 to 21.00
Steel car axles	.....	14.00 to 14.50
No. 1 busheling	.....	9.00 to 9.50
No. 2 busheling	.....	6.00 to 6.50
Cut forge	.....	10.00 to 10.50
Pipes and flues	.....	7.00 to 7.50
No. 1 railroad wrought	.....	10.50 to 11.00
No. 2 railroad wrought	.....	10.00 to 10.50
Steel knuckles and couplers	.....	12.50 to 13.00
Coil springs	.....	13.50 to 14.00
No. 1 machinery cast	.....	13.50 to 14.00
Low phos. punchings	.....	11.50 to 12.00
Locomotive tires, smooth	.....	11.00 to 11.50
Machine shop turnings	.....	3.50 to 4.00
Cast borings	.....	5.50 to 6.00
Stove plate	.....	13.00 to 13.50
Grate bars	.....	10.50 to 11.00
Brake shoes	.....	11.00 to 11.50
Railroad malleable	.....	12.50 to 13.00
Agricultural malleable	.....	12.00 to 12.50
Country mixed	.....	8.00 to 8.50

"Safety Work at Ironwood, Mich." is a treatise published by the Bureau of Mines for May, 1921, under the heading of "Reports of Investigations." The author is Richard V. Agerton, metal mining engineer, United States Bureau of Mines. Safety work was started by the Oliver Iron Mining Co. at Ironwood in 1913. The article tells of the methods used and the results.

Hild & Bauer, Cincinnati, dealers in old materials, have leased seven acres from the Big Four Railroad in the Ivorydale section of Cincinnati, and contemplate the establishment of a large scrap iron yard completely equipped for preparing scrap for the market. The present yards of the company, located on Mill Street, will be retained.



## IRON AND INDUSTRIAL STOCKS

## Recent Quotations Based on Uncertainty of the Business Outlook

Aside from a few short periods, the course of security values throughout May was downward. The close of the month found the pressure to sell less pronounced and quotations for many issues on a basis attractive from the investment standpoint. The same lack of buying power exists for securities, however, as does for raw and manufactured products. This lack of confidence appears to be based on the business outlook for the summer, the omitting of dividends on both common and preferred shares by some of the important companies in their respective industries, a belief that liquidation, especially of labor, has not run its course and the difficulty of securing working capital notwithstanding the more favorable financial position of the country as a whole. While it is true constructive forces are working, they are not sufficiently advanced to relieve the tension of industrial uncertainty.

Railroad securities apparently are in better investment demand than iron and industrial stocks, possibly because it is expected they will be obliged to pay less for labor and thereby work themselves out of financial difficulties. Any real improvement in the condition of the railroads, however, probably would be reflected at once in the steel industry because of the urgent needs of the carriers. Automobile and allied shares, which less than a month ago established new high records for 1921, made new lows the past week. The outlook for the industry does not encourage investment. Coke and iron producers report little demand for their product, which explains prices recently quoted for such shares.

The range of prices on active iron and industrial stocks from Saturday of last week to Monday of this week was as follows:

Allis-Chalm. com. 31 1/2 - 36	Int. Har. pf. .... -102 1/2
Allis-Chalm. pf. 75 1/4 - 76	Lack. Steel .... 47 1/4 - 49
Am. Can. com. 28 1/4 - 31	Midvale Steel .. 27 - 27 1/2
Am. Can. pf. .... 83 1/2 - 84	Nat.-Acme .... 20 1/2 - 21
Am. C. & F. com. 122 - 124 1/2	Nat. E. & S. com. 49 1/2 - 52
Am. C. & F. pf. 108 - 109	Nat. E. & S. pf. 88 - 89 1/2
Am. Loco. com. 83 - 87	N. Y. Air Brake 65 1/4 - 68
Am. Loco. pf. .... -102	Nova Scotia Steel 29 1/2 - 33
Am. Rad. com. .... - 70	Pitts. Steel pf. 80 1/4 - 81 1/2
Am. Stl. F. com. 28 1/2 - 29 1/2	Press. Steel com. 80 - 83 1/2
Am. Stl. F. pf. .... - 85	Press. Steel pf. .... - 89
Bald. Loco. com. 77 1/2 - 86	Ry. Stl. S. com. 82 1/4 - 85
Bald. Loco. pf. .... 99 1/2 - 100	Replogle Steel .. 26 - 27
Beth. Steel com. 55 - 55 1/2	Republic com. 55 1/2 - 59 1/2
Beth. Steel Cl. B. 55 1/2 - 60 1/4	Republic pf. .... 89 - 89 1/2
Beth. Stl. 8% pf. 101 1/2 - 102 1/4	Sloss, com. .... 39 - 39 1/2
Chic. Pneu. Tool. 60 - 63	Superior Steel .. 39 - 40
Colo. Fuel ..... 28 1/2 - 30	Trans.-Williams. .... - 38 1/2
Cruc. Steel com. 67 1/4 - 73 1/2	Un. Alloy Steel.. 29 - 29 1/2
Cruc. Steel pf. .... - 84	U. S. Pipe com. 15 - 15 1/2
Gen. Elec. .... 131 1/4 - 137	U. S. Steel com. 81 1/2 - 84
Gt. No. Ore Cert. 28 1/2 - 29 1/4	U. S. Steel pf. 107 1/4 - 108 1/2
Gulf States Steel 33 1/4 - 37 1/4	Vanadium Steel . 31 - 32 1/2
Int. Har. com. 86 1/4 - 91	West'ghouse Elec. 45 1/4 - 47

## Industrial Finances

The Mead-Morrison Mfg. Co., East Boston, hoisting machinery, on Dec. 31, last, had total assets and liabilities of \$4,184,828, according to a statement filed with the Massachusetts secretary of state, as against \$4,367,589 at the close of 1919. The surplus account stood at \$1,307,583, indicating net profits last year of \$197,500.

Although the Colorado Fuel & Iron Co.'s gross receipts for the quarter ended March 31, last, were \$10,028,742, or \$340,859 less than those for the like period last year, the surplus after interest, taxes, sinking fund, etc., amounted to \$505,527, an increase of \$84,959, and equal after preferred dividends to \$1.52 a share on the common stock. In the same quarter in 1920, \$1.11 a share was earned on the common stock.

According to a statement filed with the Massachusetts Commissioner of Corporations, dated April 1, 1921, the total assets and liabilities of the American Bridge Co. are \$52,807,254, contrasted with \$59,341,908 at the close of the previous year.

The total assets and liabilities of the Rolls-Royce Co. of America, Inc., as of Dec. 31, 1920, were \$7,952,502, as against \$3,504,740 at the end of 1919, according to a statement filed with the Massachusetts Commissioner of Corporations. During the year the capital stock was increased from \$3,500,000 to \$7,100,000.

For 1920 the Union Twist Drill Co., Athol, Mass., showed net profits, after deducting reserve for depreciation and federal taxes of \$1,278,293. The net earnings in 1919 were

\$1,389,373. Current assets at the close of 1920 were \$5,055,955, or more than three and one-half times the \$1,391,368 current liabilities and tax reserve.

Net earnings of the Ingersoll-Rand Co. last year were \$5,841,191, or \$2,275,361 less than those for 1919. There was a surplus last year of \$2,644,780, against one of \$3,775,794 in 1919, a decrease of \$1,131,014.

Directors of the Lackawanna Steel Co., voted to omit the quarterly dividend of 1 1/2 per cent. due at this time. Regular dividends at the annual rate of 6 per cent have been paid since Sept. 30, 1916. In addition, an extra dividend of 3 per cent was declared in that year, one of 3 1/2 per cent and one of 2 1/2 per cent in 1917 and an extra 2 1/2 per cent in 1918.

The statement of the Penn Seaboard Steel Corporation for the quarter ended March 31, as submitted to the New York Stock Exchange, showed a deficit, after charges, of \$230,895. Gross sales amounted to \$486,756 and cash \$562,687.

The Birmingham Steel Corporation, Birmingham, Ala., has filed an answer to the involuntary bankruptcy action brought against it by some creditors in Birmingham Federal court denying insolvency. The company claims a balance to its credit when it finally effects settlement with the Government, which financed the building of the plant during the war. The Birmingham Steel Corporation fabricated steel for 12 steel ships built by the Mobile Shipbuilding Co. during the war and has since been furnishing steel for large buildings and bridges in the South. H. Leon Brittain, of New York, is president.

The stockholders of the Belfont Iron Works Co., Ironton, Ohio, will meet on June 10 to act on a proposed increase in the capitalization of the company from \$625,000 to \$2,000,000. It is understood that should favorable action be taken, the stock will be taken up by the present stockholders.

The 1920 report of the Willys-Overland Co. shows the company operated at a loss of \$5,480,394, as against a profit of \$1,735,268 in 1919. After paying dividends on the common and preferred shares and making provision for preferred stock redemptions, there was a deficit of \$9,338,716 last year, as contrasted with one of \$2,272,833 the previous year. At the close of 1920 the profit and loss surplus stood at \$8,136,372; at the end of 1919 it was \$21,896,510 and of 1918, \$26,340,885.

Both the Cambria Steel Co. and the Midvale Steel & Ordnance Co. have passed the quarterly dividend of 50 cents per share, action by the latter company having been taken April 6 and by the former on May 17.

The American Bosch Magneto Corporation, Springfield, Mass., has sold \$2,500,000 8 per cent 15-year sinking fund notes to bankers, who in turn are making a public offering.

The Duquesne Light Co., Pittsburgh, operating local electric generating plants, has arranged for a bond issue to total \$10,000,000. A. W. Thompson is president.

## Trade Changes

The Martell Packings Co., Elyria, Ohio, will manufacture the line of air tools being marketed by the Turbine Air Tool Co., Cleveland, which includes drills for wood and metal grinders, wood planers and groovers, marble polishers, and sanding machines. It has also started construction of a number of "Manzorn" coffee infusers for the Manthey-Zorn Laboratories Co. of Cleveland. These two undertakings will probably be the basis for expansion of the Martell Packings Co. The manufacture of a complete line of metallic packing will be continued. D. S. Cole, formerly production manager of the Leece-Neville Co., is the general manager of the Martell Packings Co. A. H. Krugman will continue as superintendent in charge of manufacturing, and C. R. Jenks, formerly of the Turbine Air Tool Co., will act as production manager.

The Iron Trade Products Co., Pittsburgh, has opened a new branch office in Philadelphia in the Pennsylvania Building, telephone Spruce 5611, in charge of A. Giraud Foote, resident manager, who will serve that district with ores, pig iron, alloys, fluorspar, iron and steel products, coal and coke.

The Bayonne Bolt & Nut Co., Bayonne, N. J., has established a Philadelphia district sales office to cover Wilmington, Baltimore and Pennsylvania, east of Harrisburg, as well as the Philadelphia district, in charge of S. H. Truitt, Land Title Building, Philadelphia. Mr. Truitt was for a number of years district sales manager of the LaBelle Iron Works.

The Philadelphia office of the Combustion Engineering Corporation is now located on the tenth floor, Finance Building, in charge of W. C. Stripe.

The Canton Foundry & Machine Co. is now located at 45 West Eighteenth Street, second floor, New York.

## FOREIGN INQUIRIES

### Chinese Railroad Buying Continues—Ocean Freight Prohibit Imports of Ore and Pig Iron

NEW YORK, May 31.—The export situation continues unchanged except for a large volume of inquiries from various markets, many of which are for railroad material and machinery. While China has purchased heavily of rolling stock, there are still some inquiries in the market and prospects of heavy purchases in the future. Three rail inquiries from India total 11,000 tons.

Chinese purchases of rolling stock to date include the 42 locomotives recently placed by the Pekin-Kalgan Railroad and five additional, which are still pending. There are still 30 locomotives to be purchased on inquiries. The Tientsin-Pukow Railroad has ordered 300 cars and is in the market for 100 more. The Shantung Railroad has purchased nine locomotives and the Pekin-Mukden Railroad inquiry is still pending, although it is reported to have placed 4700 tons of rails with a New York exporter, who has placed the order with one of the leading interests. Buying by China will be greatly assisted by the recent action of the Shanghai association of Chinese bankers, who have refused to act as brokers for further issues of domestic paper and have offered to work out a program for China's finance. This action was taken independently of the Consortium and is behind much of the present buying. The need for railroad communication in China is great with only about 6000 to 7000 miles of railroad in the entire country.

#### Australian Revival Foreseen

Exporters in touch with Australian conditions foresee a sudden revival when the situation there has sufficiently cleared to warrant the continuance of many old projects and the inauguration of new construction programs. While England will be given preference in purchases of iron, steel and machinery, there will undoubtedly be considerable buying of American material. The European situation is entering upon a new phase of higher exchange rates from the standpoint of the American exporter. One exporter, who recently engaged in negotiations for the sale of Belgian billets to a Canadian rolling mill, found at the last moment that exchange rates on the Belgian franc had risen too high to make the transaction profitable. Billets are evidently the only Belgian material that can be successfully imported for consumption in the United States

## BELGIAN STEEL MARKET

### Temporary Pressure from Germany But Real Competition from France and Luxemburg

CHARLEROI, BELGIUM, May 5.—The stability of the Belgian market was put to a severe test in February and March by keen German competition, especially in bar iron, hoop iron, sheets, wire rods, wire nails and piping, but it is hoped that the 50 per cent export tax will go a long way toward improving the tone of the market. The effect of this import restriction on German material has not yet made itself felt to any extent, principally because most of the present shipments are on old orders which, being paid prior to March 8, are exempt from the export tax. Little activity is noted and prices are still far from satisfactory. The building field continues dull, contractors refusing to act until prices for cement, bricks, fabricated steel, piping, etc., have been reduced. It is noteworthy that the present condition of the Belgian market has been caused not only by keen competition from German industry but also by the strong efforts of France and Luxemburg, the effects of which are being felt both at home and abroad.

#### French Hold on Belgian Market

The following figures illustrate the trend of French and Belgian iron exports: In 1919 Belgium exported

and these are profitable purchases only when the buyer is on tidewater or in the vicinity of a port. Pig iron is still too high to interest American consumers, but the foreign markets are being watched by exporters and dealers in pig iron, and when quotations have declined sufficiently, some pig iron importation may be expected.

While Belgian wire rods are quoted at extremely low prices compared with American material, one exporter in New York recently received a cable inquiry for 1000 tons of wire rods of various specifications from a buyer in Holland. The American quotation on the material put down in Holland was about 100 per cent higher than the Continental price. India continues to inquire for and place orders on cast iron pipe, one exporter having recently received inquiries totaling 200,000 ft. One of these inquiries was for about 15,000 ft. of cast iron pipe, the product of a large pipe producer being specified. American engineers are reported to be considering bids on the erection of a large rolling mill in India.

#### Ore Importation Unprofitable

The coal situation with Germany is proving detrimental to sales of American coal, according to the American representative of a large German interest. Much of the indemnity coal now being shipped by Germany to France and Belgium is being resold from an already glutted market and at low prices that easily compete with sales of the American and British product. This representative, who was recently in Europe, noted the sailing of 10 ships with cargoes of coal from Rotterdam to foreign ports, a large portion of the shipments being consigned to Italy. The present high ocean freights preclude any importation of German or other foreign, medium grade ores at a profit, according to this representative, but a revival of trade with European markets and lower ore rates when it is needed as ballast, coupled with a clearing of the domestic situation, will probably permit sales of foreign ore in this country, although it will be confined to furnaces near the seaboard.

#### Electric Cables for Poland

The large machine tool inquiry being handled by R. S. Stokvis & Sons, 17 Battery Place, New York, for tools for South Africa, will probably be closed shortly. The Agence Immobilière et Commerciale Union, rue Kosciuszko 24, Czenstochova, Poland, informs THE IRON AGE that it wishes to import electrical cables into Poland and desires to get in touch with makers of such cables.

to France 44,226 tons of pig iron, semi-finished iron, and finished iron, products valued at 35,005,000 fr. compared with 284,425 tons valued at 217,713,000 fr. in 1920. French exports of iron to Belgium in 1919 totaled 136,271 tons valued at 79,623,000 fr. compared with 538,119 tons valued at 300,170,000 fr. in 1920. France is steadily extending its hold on the Belgian pig iron and semi-finished products market as is revealed by the fact that while 148,567 tons of pig iron and 200,000 tons of semi-finished products were shipped to Belgium during 1920 only 48 per cent were re-exported to France by Belgium.

#### Ore and Pig Iron Decline

The tone of the iron ore market is rather quiet and the blowing out of English blast furnaces has resulted in a further increase of stocks. Iron ores from Normandy which were quoted at 20 fr. per ton (\$1.65) f.o.b. French port at the end of March, are now offered at about 14 fr. (\$1.15); Briey ores are around 15 fr. per ton (\$1.23) and Spanish Rubio ores, 50 per cent, are quoted at 35 s. (\$5.90) per ton, c.i.f., Antwerp.

A feature of the pig iron market is the glut of offers from Luxemburg and French smelters. With 25 blast furnaces, out of a total of 54, in operation, the output during March amounted to 106,360 tons compared with 207,058 tons in March, 1913. The slump in production compared with the March, 1920, figures is approximately 30 per cent. Foreign com-



petition is compelling producers to cut production cost to the utmost as with coke at 117.50 fr. per ton (\$9.65) there is but a small margin of profit with pig iron at 280 (\$23.04) to 290 (\$23.86) fr. per ton, f.o.b. furnace. Basic steel and pig iron for refining is even obtainable at 260 (\$21.40) to 265 (\$21.80) fr., furnace. Luxemburg smelters are offering pig iron at 280 fr. (\$23.04), f.o.b. Belgian station or about 270 fr. (\$22.22) f.o.b. frontier point. Belgian pig iron for export is offered at 105 to 110 shillings, c.i.f. British east coast ports.

#### Semi-Finished Steel Cut by Competition

Producers of semi-finished material have decided upon ruthless price cuts with a view of keeping out Luxemburg competition and are now naming 325 (\$26.75) to 335 (\$27.57) fr. per ton, f.o.b. mill, for cogged blooms against 350 (\$28.80) to 360 (\$29.63) fr., f.o.b. mill, the Luxemburg price. French mills, however, have come forward with rather tempting prices, Lorraine and Saar mills quoting 315 (\$25.92) to 325 (\$26.75) fr. per ton, f.o.b. frontier station while sheet bars from Lorraine bring 375 (\$30.94), f.o.b. Antwerp. Belgian basic billets fetch 335 (\$27.57) to 350 (\$28.80) fr. and sheet bars 360 (\$29.63) to 380 (\$31.35) fr. For open hearth material an additional 20 (\$1.65) to 25 (\$2.06) fr. per ton is charged.

A slight improvement in finished iron and steel during the past two weeks is noticeable, but prices are still 75 to 100 fr. per ton below the figures named at the beginning of the year. We quote No. 2 wrought iron bars at 435 (\$35.80) to 460 fr. (\$37.86) per ton, f.o.b. maker's mill and £8 15s. to £9 f.o.b. Antwerp for export; 460 (\$37.86) to 480 fr. (\$39.50) for No. 3 and £9 9s. to £9 10s. f.o.b. Antwerp; and 440 (\$36.21) to 450 fr. (\$37.14) for mild steel bars, £8 10s., f.o.b. Antwerp. Hoop iron quotations range from 675 (\$55.55) to 700 fr. (\$57.61) per ton, but domestic consumers display very little inclination to place orders at that level, their inquiries usually calling for 650 (\$53.55) to 675 fr. (\$55.55) per ton. £13 10s. is the price quoted for export shipments. Angles and flats are obtainable at 455 (\$37.45) to 465 fr. (\$38.37) for domestic consumers, export prices being around £9 5s.. For sheets and plates we quote as follows: Mild steel sheet, No. 14 U. S. S. gage, 615 (\$50.61) to 620 fr. (\$51.02); No. 11 gage, 610 (\$50.20) to 615 fr. (\$50.61); No. 1 gage, 600 (\$49.38) to 610 fr. (\$50.20); No. 0 to No. 0000 gage, 700 (\$57.61) to 725 fr. (\$59.57); boiler plate, open-hearth 750 (\$61.73) to 800 fr. (\$65.84); galvanized sheets, No. 0 to 0000 gage, 1700 (\$139.91) to 1800 fr. (\$148.14). There is a firmer tone in the wire market owing to the elimination of German competition. Barbed wire is quoted at 105 fr. per 100 kg. (\$8.65), f.o.b. maker's works, and galvanized wire at 85 fr. (\$7.06). The base price for nails, domestic delivery, is 650 fr. (\$53.55) per ton, while the export price is about 15s. (\$2.91) per cwt. Beams are slumping, prices for heavy shapes having receded to 450 (\$37.03) to 465 fr. (\$38.27) during the past few weeks.

#### Rails Decline with Mills Full

A curious situation obtains in the rail market since prices are still on the downward slide, although mills are reported to be fairly well employed. Tenders were recently invited by the Danish State Railroads. The recent award of 7400 tons by the Danish railroads to the Ougrée-Marihaye Co. was placed at 235 Danish crowns, representing about 575 fr. (Belgian) per ton, c.i.f. Copenhagen (\$47.32). If the alleged order for 30,000 steel rails by the Russian Soviet Government should be authentic, the aggregate orders which Belgian rail mills have on their books would be about 70,000 to 80,000 tons. It is noteworthy, however, that orders for heavy steel rails may now be booked at 550 fr. per ton (\$45.27), while light rails are to be had as low as 500 fr. (\$41.15). Recently the Rochdale Corporation Tramway Committee invited tenders for 10 tons of steel tires. British bidders figured on £45 per ton (\$174.82), f.o.b. Rochdale, while one of the Belgian works quoted £25 5s. per ton (\$98.10), f.o.b. Antwerp. Since freight rates from Antwerp to Rochdale are about £2 5s. per ton, the Belgian offer was by £17 10s. (\$67.98) lower.

## ITALIAN MARKET DORMANT

### Low-Priced Luxemburg Pig Iron—Structural Steel at 2.65c. per Pound

MILAN, ITALY, May 15.—Prices are still going down. Sales as in the past weeks are few in number. Although it is the general opinion that prices are bound to go up in the near future, no one seems inclined to buy. Perhaps after to-day's elections things may change.

American quotations on foundry pig iron, which might be of interest to us at present, are around \$38 which is equal to about 720 lire per ton c.i.f., Genoa. The Luxemburg foundry iron is quoted as low as 470 lire, free on cars, Modane.

There is practically no demand for steel sheets. There seems to be large stocks on hand and besides the Italian industry is to-day in a position to supply anything to cover its small demand. Construction iron and steel is quoted at 110 lire per hundred kilos (\$2.65. per lb.), free on cars, customer's plants. This was the actual price paid by a large bridge manufacturer in Turin. Under these conditions it seems hard for Americans to compete.

The Fiat automobile firm is again working normally, having discharged 3500 workmen of a total of 14,000. Wages remain unchanged. It will be some time before Italy can start reducing wages as the cost of living is not going down; if any change is taking place the cost of living is going up a few points. This is partly due to the fact that the government has recently done away with the political price on bread, which is also one of the reasons of the bettering of the Italian exchange.

This week's prices compared with those of a month and two months ago are as follows, per 100 kg., f.o.b. Milan:

	March 19	April 17	May 14	May 14 Cents Per Lb.
Copper, electrolytic .....	725	630	600	14.40
Copper sheets .....	1200	1100	1025	24.60
Brass sheets .....	1100	970	930	22.32
Brass wire .....	1075	950	900	21.60
Brass rods .....	620	580	550	13.20
Brass tubes .....	1250	1150	1100	26.40
Black sheets base, 4 mm....	200	160	160	3.84
Galvanized sheets, No. 20....	320	285	260	6.24
Tin plate, standard, per case	230	215	185	\$9.80

### Industrial Medicine and Americanization

Industrial medicine is among the subjects discussed in "Immigrant Health and the Community," a book about to be published, as the fifth of a series of Americanization studies made under the auspices of Carnegie Corporation of New York. The entrance of industry into community medical care has been frequently observed to coincide with a low level of public health work in the same area. This is particularly true in regions where the community consists largely of foreign-born employees too recently immigrated to take much part in normal community activities. On the whole, the work contends that, except temporarily under pioneer conditions, the development of industrial medical service outside the industrial establishment itself must be regarded as an influence against Americanization in the larger sense and against the more permanent interests of the communities' medical and health work.

Vessel rates on ore will probably be established within a week or two and it is expected that the rate will be from 80 to 90 cents from the head of the lakes. Last year the rate was established at 81, but early in the season owing to delays to vessels, caused by car shortages and other conditions that interfered with vessel traffic, the rate was advanced to \$1.10.

The Port Richmond Scrap Iron & Metal Co., Philadelphia, has purchased from the United States Shipping Board about 7000 tons of steel in the form of plates, bars, angles and channels. This material is now stored in the yard of the Merchants' Shipbuilding Corporation, Bristol, Pa.

# Prices Finished Iron and Steel, f.o.b. Pittsburgh

## Freight Rates

Freight rates from Pittsburgh on finished iron and steel products, in carload lots, to points named, per 100 lb., are as follows:

Philadelphia .....	\$0.35	St. Paul .....	\$0.665
Baltimore .....	0.335	Omaha .....	0.815
New York .....	0.38	Omaha (pipe) .....	0.77
Boston .....	0.415	Denver .....	1.35
Buffalo .....	0.295	Denver (wire products) .....	1.415
Cleveland .....	0.24	Pacific Coast .....	1.665
Cincinnati .....	0.325	Pacific Coast, ship plates .....	1.335
Indianapolis .....	0.345	Birmingham .....	0.765
Chicago .....	0.38	Jacksonville, all rail .....	0.555
St. Louis .....	0.475	Jacksonville, rail and water .....	0.46
Kansas City .....	0.815	New Orleans .....	0.515
Kansas City (pipe) ..	0.77		

The minimum carload to most of the foregoing points is 36,000 lb. To Denver the minimum loading is 40,000 lb., while to the Pacific Coast on all iron and steel products, except structural material, the minimum is 80,000 lb. On the latter item the rate applies to a minimum of 50,000 lb., and there is an extra charge of 9c. per 100 lb. on carloads of a minimum of 40,000 lb. On shipments of wrought iron and steel pipe to Kansas City, St. Paul, Omaha and Denver, the minimum carload is 46,000 lb. On iron and steel items not noted above the rates vary somewhat and are given in detail in the regular railroad tariffs.

Rates from Atlantic Coast ports (i.e., New York, Philadelphia and Baltimore) to Pacific Coast ports of call on most steamship lines, via the Panama Canal, are as follows: Pig iron, 55c.; ship plates, 70c.; ingot and muck bars, structural steel, common wire products, including cut or wire nails, spikes and wire hoops, 75c.; sheets and tin plates, 60c. to 75c.; rods, wire rope, cable and strands, \$1; wire fencing, netting and stretcher, \$1; pipe, not over 8 in. in diameter, 85c.; over 8 in. in diameter, 2½c. per in. or fraction thereof additional. All prices per 100 lb. in carload lots, minimum 40,000 lb.

## Structural Material

I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in., on one or both legs, ¼ in. thick and over, and zeos, structural sizes, 2.20c.

## Wire Products

Wire nails, \$3 to \$3.25 base per keg; galvanized, 1 in. and longer, including large-head barbed roofing nails, taking an advance over this price of \$1.50 and shorter than 1 in., \$2; bright Bessemer and basic wire, \$3.00 per 100 lb.; annealed fence wire, Nos. 6 to 9, \$3.00; galvanized wire, \$3.70; galvanized barbed wire, \$4.10; galvanized fence staples, \$4.10; painted barbed wire, \$3.40; polished fence staples, \$3.40; cement-coated nails, per count keg, \$2.85; these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days, net, less 2 per cent off for cash in 10 days. Discounts on woven-wire fencing are 60½ to 63 per cent off list for carload lots, 59½ to 62 per cent for 1000-rod lots, and 58½ to 61 per cent for small lots, f.o.b. Pittsburgh.

## Bolts, Nuts and Rivets

Large structural and ship rivets.....\$3.15 to \$3.25  
Large boiler rivets ..... 3.25 to 3.35 || Small rivets ..... | 60, 10 and 10 per cent off list |
Small machine bolts, rolled threads, 60, 10 and 10 per cent off list	
Same sizes in cut threads.....	60 and 10 per cent off list
Longer and larger sizes of machine bolts.....	60 per cent off list
Carriage bolts, ½-in. x 6-in.:	
Smaller and shorter, rolled threads.....	60 and 5 per cent off list
Cut threads .....	50, 10 and 5 per cent off list
Longer and larger sizes.....	50 and 10 per cent off list
Lag bolts .....	65 per cent off list
Plow bolts Nos. 1, 2 and 3 head.....	50, 10 and 5 per cent off list
Other style heads.....	20 per cent extra
Machine bolts, c.p.c. and t. nuts ½-in. x 4-in.:	
Smaller and shorter.....	50, 10 and 5 per cent off list
Longer and larger sizes.....	50 and 5 per cent off list
Hot pressed sq. or hex. blank nuts.....	\$4.00 off list
Hot pressed nuts, tapped.....	\$3.50 off list
C. p. c. and t. sq. or hex. nuts, blank.....	\$4.00 off list
C. p. c. and t. sq. or hex. nuts, tapped.....	\$3.50 off list
Semi-finished hex. nuts:	
¼ to 9/16 in. inclusive U. S. S.....	80 and 10 per cent off list
Same sizes S. A. E.....	80, 10 and 10 per cent off list
¾ to 1 in. inclusive U. S. S. and S. A. E.,	
70, 10 and 10 per cent off list	
Stove bolts in packages.....	80 and 10 per cent off list
Stove bolts in bulk.....	80, 10 and 2½ per cent off list
Tire bolts .....	65, 10 and 10 per cent off list
Track bolts .....	4.35c. base

**Square and Hex. Head Cap Screws**  
½ in. and under.....70 per cent off list  
9/16 in. to ¾ in.....70 per cent off list

## Set Screws

½ in. and under.....70 and 5 to 70 and 10 per cent off list  
9/16 in. to ¾ in.....70 per cent off list

## Rivets

Rivets, 1c. per lb. extra for less than 200 kegs. Rivets in 100-lb. kegs, 25c. extra to buyers not under contract; small and miscellaneous lots less than two tons, 25c. extra; less than 100 lb. of a size, or broken kegs, 50c. extra.

All prices carry standard extras f.o.b. Pittsburgh.

## Wire Rods

No. 5 common basic or Bessemer rods to domestic consumers, \$48; chain rods, \$48; screw stock rods, \$53; rivet and bolt rods and other rods of that character, \$48; high carbon rods, \$58 to \$73, depending on carbons.

## Railroad Spikes and Track Bolts

Railroad spikes, 9/16-in. and larger, \$3.25 to \$3.40 base per 100 lb. in lots of 200 kegs of 200 lb. each or more; spikes, ½-in., ¾-in., and 7/16-in., \$3.40 base; 5/16-in., \$3.40 base. Boat and barge spikes, \$3.40 to \$3.65 base per 100 lb. in carload lots of 200 kegs or more, f.o.b. Pittsburgh. Track bolts, \$4.35 to \$4.50 base per 100 lb. Tie plates, \$2.50 per 100 lb.; angle bars, \$2.75 per 100 lb.

## Terne Plates

Prices of terne plates are as follows: 8-lb. coating, 200 lb., \$12.30 per package; 8-lb. coating, I. C., \$12.60; 12-lb. coating, I. C., \$14.30; 15-lb. coating, I. C., \$15.30; 20-lb. coating, I. C., \$16.55; 25-lb. coating, I. C., \$17.80; 30-lb. coating, I. C., \$18.80; 35-lb. coating, I. C., \$19.80; 40-lb. coating, I. C., \$20.80 per package, all f.o.b. Pittsburgh, freight added to point of delivery.

## Iron and Steel Bars

Steel bars at 2.10c. from mill. Refined bar iron, 2.75c.

## Welded Pipe

The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
¼ to ¾.....	50½	24	¼ to ¾.....	2½	+28½
¾ to 1.....	52½	26	¾ to 1.....	27½	9½
1 to 1½.....	56½	42	1 to 1½.....	33½	18½
1½ to 2.....	60½	48	1½ to 2.....	35½	20½
2 to 3.....	62½	50			
<b>Lap Weld</b>			<b>Lap Weld</b>		
2.....	54½	42	2.....	30½	16½
2½ to 6.....	58½	46	2½ to 6.....	33½	20½
7 to 12.....	54½	41	7 to 12.....	29½	16½
13 to 14.....	45	..			
15.....	42½	..			
<b>Butt Weld, extra strong, plain ends</b>			<b>Butt Weld, extra strong, plain ends</b>		
¼.....	46½	29	¼ to ¾.....	+10½	+43½
¾ to 1.....	48½	31	¾.....	26½	14½
1.....	53½	42	¾.....	33½	21½
1½.....	58½	47	1 to 1½.....	35½	21½
1 to 1½.....	60½	49			
2 to 3.....	61½	50			
<b>Lap Weld, extra strong, plain ends</b>			<b>Lap Weld, extra strong, plain ends</b>		
2.....	52½	41	2.....	31½	18½
2½ to 4.....	56½	45	2½ to 4.....	34½	22½
4½ to 6.....	55½	44	4½ to 6.....	33½	21½
7 to 8.....	50½	37	7 to 8.....	24½	12½
9 to 12.....	45½	32	9 to 12.....	19½	7½

To the large jobbing trade an additional 1, 5 and 2½ per cent is allowed over the above discounts, which are subject to the usual variations in weight of 5 per cent.

## Boiler Tubes

The following are the discounts for carload lots f.o.b. Pittsburgh:

Lap Welded Steel		Charcoal Iron	
1½ in.....	19½	1½ in.....	+10
2 to 2½ in.....	30	1½ in.....	List
2½ to 3 in.....	41	2 to 2½ in.....	-10
3½ to 13 in.....	47	2½ to 2¾.....	-15
		3 to 3½ in.....	-16
		3½ to 4½ in.....	-20

## Carload Discounts on Standard Commercial Seamless—Cold Drawn

1 in.....	56	2 to 2½ in.....	17½
1½ in.....	49	2½ and 4 in.....	20
1¾ in.....	48	4½ to 5 in.....	7½
1½ in.....	25		

## Hot Rolled

These prices do not apply to special specifications for locomotive tubes nor to special specifications for tubes for the Navy Department which will be subject to special negotiations.

## Sheets

Prices for mill shipments on sheets of standard gage in carloads, f.o.b. Pittsburgh, follow:

Blue Annealed		Cents per Lb.	
No. 8 and heavier.....	3.00	Nos. 11 and 12.....	3.15
Nos. 9 and 10		Nos. 13 and 14.....	3.20
(base) .....	3.10	Nos. 15 and 16.....	3.30
Box Annealed, One Pass Cold Rolled		Cents per Lb.	
Nos. 17 to 21.....	3.80	No. 28 (base).....	4.00
Nos. 22 to 24.....	3.85	No. 29 .....	4.10
Nos. 25 and 26.....	3.90	No. 30 .....	4.20
No. 27 .....	3.95		

## Galvanized

Cents per Lb.		Cents per Lb.	
Nos. 10 and 11.....	4.00	Nos. 25 and 26.....	4.70
Nos. 12 to 14.....	4.10	No. 27 .....	4.85
Nos. 15 and 16.....	4.25	No. 28 (base).....	5.00
Nos. 17 to 21.....	4.40	No. 29 .....	5.25
Nos. 22 to 24.....	4.55	No. 30 .....	5.50

## Tin-Mill Black Plate

Cents per Lb.		Cents per Lb.	
Nos. 15 and 16.....	3.80	No. 28 (base).....	4.00
Nos. 17 to 21.....	3.85	No. 29 .....	4.05
Nos. 22 to 24.....	3.90	No. 30 .....	4.05
Nos. 25 to 27.....	3.95	Nos. 30½ and 31.....	4.10



## Non-Ferrous Metals

### The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York		Tin New York	Lead		Zinc	
	Lake	Electro- lytic		New York	St. Louis	New York	St. Louis
May							
25	13.25	13.25	32.00	5.00	4.75	5.25	4.75
26	13.25	13.25	32.50	5.00	4.75	5.25	4.75
27	13.25	13.25	32.25	5.00	4.70	5.25	4.75
28	13.25	13.25	.....	5.00	4.70	5.25	4.75
31	13.25	13.25	31.50	5.00	4.70	5.25	4.75

NEW YORK, May 31.

All the markets are exceedingly quiet, due largely to the holiday recess, very little business having been done on Saturday. Demand for copper has declined and not much business has been done in tin. Both the lead and zinc markets continue quiet with the tone easy.

### New York

**Copper.**—Foreign buying of copper, which has been the feature of the market in recent weeks, has turned exceedingly quiet, due largely to the sudden drop in exchange values the latter part of last week. Domestic business has also come to a standstill, largely because of the holidays, but it has been very light at the best. There has been practically no change in quotations. Electrolytic copper is obtainable for 13.25c., New York, or 13.50c., delivered, for early or June delivery, while Lake copper is practically on a parity.

**Copper Averages.**—The average price of Lake copper for the month of May, based on daily quotations in THE IRON AGE, was 12.96c. The average price of electrolytic was 12.79c.

**Tin.**—The market continues quiet and very little business is recorded. The feature is the limited number of sellers and their indifference to sell, which has resulted in a steady market despite rather sharp declines in the London market, where values fell £3 per ton on Friday and where to-day quotations are about £7 per ton lower than a week ago, spot standard tin being quoted at £174, future standard at £175 and spot Straits at £178 per ton. On Friday in this market there were sales of 50 to 60 tons of spot Straits at 31.62½c. to 32.50c., and also two or three 25-ton lots of May-June shipment at 31.75c. The quotation for spot Straits tin to-day in this market is 31.50c., New York. Arrivals thus far this month have been 825 tons with 2705 tons reported afloat.

**Lead.**—This market has also been very quiet with the tone easy. In the outside market the feature is the pressure for sale of lots at St. Louis at 4.70c., mostly of a speculative nature. We quote the market at 4.70c., St. Louis, or 5c., New York, with the quotations of the leading interest unchanged at 5c., both New York and St. Louis.

**Zinc.**—There continues to be no improvement in demand from either consumers or dealers and business is confined to hand-to-mouth purchases, mostly of small lots. Prime Western is quoted unchanged at 4.75c., St. Louis, or 5.25c., New York, with the possibility that this could be shaded to 4.70c. or 4.72½c., St. Louis, for spot delivery.

**Old Metals.**—The market continues strong, but business does not respond as would be the case under normal conditions. Dealers' selling prices are nominally as follows:

	Cents Per Lb.
Copper, heavy and crucible.....	12.50
Copper, heavy and wire.....	11.50
Copper, light and bottoms.....	9.75
Heavy machine composition.....	12.00
Brass, heavy .....	8.00
Brass, light .....	6.00
No. 1 red brass or composition turnings.....	9.50
No. 1 yellow rod brass turnings.....	6.00
Lead, heavy .....	4.50
Lead, tea .....	3.25
Zinc .....	3.50

**Antimony.**—Wholesale lots for early delivery are quoted unchanged at 5.25c., New York, duty paid.

**Aluminum.**—The leading producer continues to quote virgin metal, 98 to 99 per cent pure, in wholesale lots for early delivery at 28c., f.o.b. plant, while other sellers offer the same grade mostly from foreign sources at 22.50c. to 23c., New York.

### Chicago

**May 31.**—The past week has been one of limited buying and tin, lead and spelter have declined. The reaction in tin is attributed to a false advance brought about through manipulation and speculative buying by dealers. While the present price is regarded as a "good buy" for delivery some months hence, a recovery in the market is not looked for until consuming demand makes itself felt. Offerings of lead and spelter by dealers, who bought for speculative purposes during the recent advances, have depressed prices in those metals. Old metal prices are unchanged. We quote Lake copper at 13.50c. in carload lots; tin, 32.50c.; lead, 4.80c.; spelter, 4.80c.; antimony, 7.50c. On old metals we quote copper wires, crucible shapes, 8.25c.; copper clips, 8c.; copper bottoms, 7c.; red brass, 7c.; yellow brass, 5c.; lead pipe, 2.75c.; zinc, 2c.; pewter, No. 1, 17c.; tinfoil, 19c.; block tin, 22c., all these being buying prices for less than carload lots.

### St. Louis

**May 30.**—The non-ferrous markets have been quiet during the week, the recent activity in lead and spelter seemingly having spent itself. Both are quoted in car lots at 4.75c. In less than car lots prices are: Lead, 5.25c.; spelter, 5.25c. to 5.50c.; tin, 37c.; copper, 13.50c.; antimony, 7.50c. In the Joplin district ores are quoted at about the same prices as last week, though there is a sagging tendency noted. Production is only fair owing to the price situation and calamine continues out of the market. A little more than half the capacity of the district is operating, only the richer and more easily worked lead and zinc properties keeping up production. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 4.50c.; heavy yellow brass, 7.50c.; heavy red brass, heavy copper and copper wire, 9c.; light copper, 8c.; pewter, 15c.; tinfoil, 18c.; zinc, 3c.; lead, 3.50c.; tea lead, 2c.; aluminum, 9c.

## Charles M. Schwab Confers with President Harding

WASHINGTON, May 31. — Necessity of exempting American ships from payment of tolls for passage through the Panama canal is understood to have been one of the chief points made by Chairman Charles M. Schwab of the Bethlehem Steel Corporation at a conference with President Harding at the White House last Thursday. Mr. Schwab was one of a number of guests of the President at luncheon, and his talk with the President immediately followed a conference the former had with leading financiers of the country, together with Secretary of the Treasury Mellon and Secretary of Commerce Hoover. The discussion of the President and Mr. Schwab is said to have included a wide range of subjects, centering around transportation, the American merchant marine and the selection of members of the Shipping Board. Mr. Schwab is quoted as having told the President that in his opinion President James A. Farrell of the United States Steel Corporation could not accept the chairmanship of the Board, and to have recommended President Charles Piez of the Link-Belt Co., former director of operations of the Emergency Fleet Corporation. It is believed the President will announce the personnel of the board this week.

John C. Haswell, president and general manager Dayton Malleable Iron Co., Dayton, Ohio, has placed the company's club house at the disposal of the College Women's Club for the purpose of carrying on social settlement work among the foreign women of the community.

## PERSONAL

Dr. Richard Moldenke, Watchung, N. J., who went to Germany about two months ago for the furtherance of trade relations in certain lines between that country and the United States, returned home last week, coming via Copenhagen. While in Berlin Dr. Moldenke addressed the foundrymen of north Germany at a special meeting, and he was a guest also at the annual convention of the non-ferrous metal interests held at the same time. He traveled through the Ruhr district, visiting by invitation the Krupp and Stinnes plants that are so important a factor in the industrial life of that section. Dr. Moldenke is hopeful for the most part concerning industrial recuperation in Germany, provided plans for financing raw material supplies can be carried out, and considers that manufacture in chemical lines will be the development of largest importance in the future. The Krupp works he found operating in the production of various new products, supplanting the war products for which they have been long famous.

Louis Stout has been elected president of the Boos Machine Co., St. Mary's, Ohio, recently organized; Albert Herzing, vice-president and C. W. Schmehl, secretary and treasurer. The company is placing on the market a stock issue of \$100,000 in common and preferred stock.

W. L. Goodhue, who for the past four years has been district manager in charge of the Dover and New Philadelphia, Ohio, plants of the American Sheet & Tin Plate Co., has been transferred to Farrel, Pa., where he has become manager of the company's Mercer works. William Weichsel, superintendent of the Dover plant, and William L. Davis, superintendent of the New Philadelphia plant, have become managers of these plants.

H. E. Curtis, formerly purchasing agent for the American Metal Co., Ltd., and its Mexican subsidiaries, is now associated with Lasker & Minck, engineers and contractors, 220 Broadway, New York.

Dr. H. K. Styrie, research laboratory, S. K. F. Ball Bearing Co., Philadelphia, discussed the heat treatment of bearing steels at the closing meeting of the season of the Boston chapter, American Society for Steel Treating, at the Engineers' Club, Boston, May 26.

A. H. Adams has resigned as chief engineer of the North Electric Mfg. Co., Galion, Ohio, and expects about Sept. 1 to establish an office in New York as consulting engineer.

W. F. Rochow, Harbison-Walker Refractories Co., was the chief speaker on May 26 at the regular monthly meeting of the Engineers' Club of the Youngstown district, at Youngstown, Ohio, on refractories.

Donald Tulloch, secretary Worcester, Mass., branch National Metal Trades Association, this week sailed for Scotland via Montreal. He will return to Worcester about Sept. 1.

Le Roi J. Williams, counsel and assistant to the general manager of the Lincoln Motor Co., has resigned. He has not yet announced his plans for the future. Mr. Williams was one of H. M. Leland's first line executives and represented him largely in all negotiations with the Government during the war.

Roy G. Owens, vice-president in charge of sales of the Lakewood Engineering Co., Cleveland, has resigned. He had been prominent in the affairs of the company since the consolidation of the Milwaukee Concrete Mixer Co. with it in 1917. His first business experience was in general and builder's hardware lines. In 1910 he joined the sales force of the Texas Portland Cement Co. and, after a year with that organization, went with the Wiley Chute Co., of which later he became proprietor. This company manufactured concrete distributing apparatus and Mr. Owens' connection with it continued from 1912 to 1917. In 1916 he became general sales manager of the Milwaukee Concrete Mixer Co., at the

same time directing the interests of his own organization. In 1917 came the consolidation of the Milwaukee company with the Lakewood Engineering Co., and Mr. Owens was put in charge of sales.

A. B. C. Hardy, assistant to W. C. Durant until he left the General Motors Corporation, and later member of the operations committee of General Motors, has been appointed general manager of the Olds Motor Works, Lansing, Mich., succeeding Edward Ver Linden, who retired recently to become associated with Durant Motors, as manager of the assembly plant in Lansing, Mich.

C. W. Leister, 829 Commercial Trust Building, Philadelphia, has been appointed representative for the Deschanel Engineering Corporation, New York, in Delaware, Maryland, eastern Pennsylvania and southern New Jersey.

Larry Hathaway, formerly with A. M. Castle & Co., at Chicago, will serve as one of the Chicago salesmen of the Lincoln Steel Co., Chicago.

C. G. Cornell, Cornell & Underhill, Greenwich and Spring streets, New York, sailed June 4 for France. He will return to the United States in about a month.

James Bowron, chairman Gulf States Steel Co., plans to sail from the Pacific Coast about Aug. 20 for a six months' tour of the Far East and India.

Libert Eyban, directeur Compagnie de Belge de Mines, Mineraux et Metaux, 113 Avenue de France, Antwerp, Belgium, sailed for Belgium on May 25, after a stay of about ten days in New York.

## New Spanish Tariff

WASHINGTON, May 31.—Commercial Attache C. H. Cunningham, cabling from Madrid, May 27, advises that the Spanish Department of State has informed him that imports from the United States will be admitted into Spain under the new minimum rates of duty until further notice. These rates average 50 per cent lower than the new general rates. It is expected that this agreement will expire within a month, when imports from the United States will be admitted under the general tariff in the absence of a special arrangement between the two nations.

The new and old minimum rates on some of the leading iron and steel and non-ferrous products, in pesetas per 100 kilos, are:

	New Rates	Old Minimum Rates
Pig iron .....	8.12	1.40
Rails .....	18.06	4.20
Tin plate .....	50.00	14.00
Cast iron pipe .....	30.00	5.00
Wheels for railroads .....	52.00	13.00
Structural steel .....	50.00	17.00
Heavy manufactures of iron, except machinery .....	60.00	17.00
Coarse iron wire .....	50.00	7.00
Wire rope .....	90.00	21.00
Wire of copper and copper alloys .....	85.50	28.50
Aluminum ingots .....	31.50	10.50
Zinc bars, etc. ....	15.00	5.00
Cranes and winches .....	80.00	20.00
Machine tools up to 500 kilos in weight .....	100.00	25.00
Machine tools over 500 kilos in weight .....	80.80	20.00
Iron or steel frames for railroad carriages .....	54.00	18.00

La Belle Iron Works has acquired about a block and a half of property at the southerly end of its Wheeling plant on the west side of McColloch street, between Thirty-first and Thirty-second streets. With this purchase the company now has four city blocks of property. The company is not yet ready to announce its plans with regard to the use of the additional land.

The Robins Conveying Belt Co., New York, in announcing its twenty-fifth anniversary, comments on the progress made in its field. The largest conveyor in existence in 1896 made of chain and steel plate carried 200 tons per hr. whereas "the engineer of today can handle 2000 or 3000 tons per hr. more easily than one tenth of such quantities was formerly moved."



## OBITUARY

**EBEN JONES**, president Globe Iron Co., Jackson Ohio, whose death was noted in last week's IRON AGE, was born in Cardiganshire, Wales, Jan. 14, 1834. The family came to this country in 1837 and settled at Hewitts Fork, Jackson County, Ohio, in 1838. In early life Mr. Jones was employed by his father in railroad construction work in Jackson County, and after spending two years at Ohio University at Athens, left college to assist his father in organizing and building the Jefferson furnace. For the six years following, Mr. Jones taught school, and during the early years of the Civil War assisted in the operation of the Jefferson furnace after school hours. He enlisted for service in the Civil War in August, 1864, joining the 179th O. V. I., and serving 11 months, during which time he was promoted to a captaincy. He became a stockholder in the Buckeye furnace in 1867 and was secretary until 1873, when he removed to Jackson to engage in building new furnaces. He was secretary of the Globe Iron Co. from Dec. 1, 1873, to Jan. 1, 1882, when he resigned to take up the management of the Buckeye furnace. He still retained his interest, however, in the Globe Iron Co. and succeeded to the presidency on the death of his father, Thomas T. Jones, in 1887. He had held that position continuously until his death. Mr. Jones was also interested in the Jackson County coal fields and in many civic and commercial affairs. He was also a prominent Mason. He was a great lover of his native (Welsh) tongue and its literature, and was foremost in holding the first Jackson County Eisteddfod at Oak Hill, Ohio, in 1875, and others held since that time.

**COL THOMAS CURTIS CLARKE**, civil and metallurgical engineer specializing in coal, coke and its by-products, died suddenly May 25 in the Roosevelt Hospital, New York, following an operation for intestinal trouble. He was born Dec. 11, 1873, at Philadelphia, the son of Thomas C. Clarke, an eminent engineer and one time president of the American Society of Civil Engineers. He was graduated from the Massachusetts Institute of Technology in 1893, had charge, for a time, of special engineering work for the Illinois Steel Co. and was once general superintendent of the Lackawanna Iron & Steel Co. He served in the world war as a colonel of the 110th Regiment of Engineers, Thirty-fifth Division, and was decorated with the Croix de Guerre following his participation in a trench raid. Since the war he has been vice-president of the International Coal Products Co. He was a member of the American Institute of Consulting Engineers, Society of American Military Engineers, American Society of Civil Engineers, Society of Chemical Industry and of the Metropolitan Club. He was a brother of E. A. S. Clarke, president Consolidated Steel Corporation, New York.

**LAWRENCE F. BRAINE**, vice-president and director Rail Joint Co., 61 Broadway, New York, died at his home in New York May 24 at the age of 64. He was the son of Admiral B. L. Braine, U. S. N. His business career started in 1896 with the Continuous Rail Joint Co., Newark, N. J., with which he became general manager. He built the business up from a struggling organization to one of power. In 1905 he effected the combination of companies making the three base supporting joints then on the market, the continuous, the Weber and the Wolhaupter joints, the merger being called the Rail Joint Co., which exists today. He retired as active vice-president in 1916, but remained a director until his death. He belonged to the American Society of Civil Engineers, the American Society for Testing Materials, the Engineers' Club of New York, the American Iron and Steel Institute, the Chicago Engineers' Club, the Duquesne Club of Pittsburgh and many other clubs. Through his efforts, the Rail Joint Co. of Canada was formed at Montreal. His success was due in large measure to his applying his entire efforts to one railroad specialty.

**KARL G. ROEBLING**, president John A. Roebling's Sons Co., Trenton, N. J., famed as the builders of the Brooklyn Bridge, died of apoplexy May 29, while playing golf. Mr. Roebling was born at Trenton in 1873, studied at the Lawrenceville Preparatory School and Princeton University, from which he was graduated in the class of 1894. Immediately after leaving Princeton he entered the business conducted by his father and uncles; he became general sales manager and second vice-president in 1899 and president on Nov. 1, 1918. During the war period, Mr. Roebling was chairman of the Sub-Committee on Wire Rope of the American Iron and Steel Institute. He was a member of the American Institute of Mining and Metallurgical Engineers.

**DWIGHT PRESTON MONTAGUE**, president Roane Iron Co., Chattanooga, Tenn., died suddenly of heart disease in his office in that city on May 25. Besides being president of the company, he was one of its largest stockholders. He was born in Pomeroy, Ohio, 68 years ago and located in Chattanooga when about 18 years of age. Besides being interested in the production of iron, Mr. Montague also took an active interest in other industrial and financial propositions and was one of the largest individual holders of real estate in Chattanooga. He was the founder and owner of the Chattanooga Sewer Pipe Works, which he disposed of later to the present owners, and was also interested in the manufacture of brick.

**HERBERT H. IVES**, one of the best known men in the scrap trade, in which he had been engaged for 35 to 40 years, died Saturday, May 28, at his home in Philadelphia following an illness of several months. For a year and a half Mr. Ives had been manager of the Philadelphia office of Charles Dreifus & Co., Pittsburgh scrap dealers, and had been assistant manager for several years prior to that. He was also in the Pittsburgh office of Charles Dreifus & Co. for about four years. He first engaged in the scrap trade in New York nearly 40 years ago with Morton B. Smith & Co. and Daniel W. Richards & Co., firms that were prominent in that time in the buying and selling of old material. Later he went to Philadelphia as local manager for the E. Buxton & Sons Co., now the Perry, Buxton, Doane Co. He then engaged in business in partnership with Allen R. Hoffer as Ives & Hoffer, his connection with Charles Dreifus & Co. following the dissolution of this partnership.

### Hardware Association Meets in Canada

The annual convention of the American Iron, Steel and Heavy Hardware Association will be held June 7 to 9, at the Windsor Hotel, Montreal, Canada. The Canadian trade has been invited to attend and about 30 Canadian houses have promised to be represented. Registration of members of the association for the trip has been heavy. The Canadian Wholesale Hardware Association has arranged for several prominent speakers to address the convention and will entertain the members of the American association. Among numerous speakers at the various sessions are: Col. Robert Starke, Starke-Seybold, Ltd., Montreal, president Canadian Wholesale Hardware Association; C. O. Hadly, Alan Wood Iron & Steel Co., Philadelphia; Job E. Hedges, New York; Herbert W. Lockwood, Edgar T. Ward's Sons Co., New York; A. I. Findley, editor THE IRON AGE, New York; Robert Hobson, president Steel Co. of Canada; Hon. Sir Lomer Gouin, formerly premier, Province of Quebec.

A. M. Castle & Co., iron and steel jobbers, 715 North Morgan Street, Chicago, will receive bids after revised plans, when the building industry becomes normal, on a one and two-story warehouse, 211x232 ft., east of the Chicago River at Blackhawk Street. The structure will cost \$300,000.

The Piedmont Units Co., Piedmont, Mo., has acquired about 6000 acres, for the establishment of a new charcoal and by-products plant, estimated to cost about \$100,000 with machinery. The initial oven equipment will include a battery of seven units.

## BILLION DOLLARS UNPAID

### Many Taxes Still Due With Almost Chaotic Conditions at Washington

WASHINGTON, May 24.—Advocating a Federal War Settlement Board and other measures to clear up the income and profits taxes for war years still outstanding, Robert G. Wilson, chief of the tax division of the American Mining Congress, Washington, to-day appeared before the Senate Committee on Finance, which is conducting hearing on tax legislation. He stated his purpose was not to urge the consideration of any particular tax plan, but rather to call attention to the feasibility of actually reducing the volume of taxes, and asserted that the solution of the problem of replacing the excess profits tax is at the finger-tips of Congress. The present problem of Federal taxation, it was stated, is not concerned alone with the urgent need for reformation of the revenue laws. No less important to the Government than to industry, according to Mr. Wilson, is the prompt and decisive determination of war tax liabilities for prior years. Therein lies the possibility of lowering future taxes, it was claimed.

#### Radical Steps Necessary

"Considerably more than \$1,000,000,000 of income and profits taxes, long past due, remains uncollected," said Mr. Wilson. "A fraction of it never will be collected under any circumstances. Unless radical steps are taken immediately, 20 per cent or more never will be collected. A comparatively negligible investment at the present should actually save the Government \$250,000,000 and bring in more than \$1,000,000,000 additional during the next two years—probably fully \$1,500,000,000. The saving in interest alone would prove a highly successful return upon the investment. The total saving, including the salvage of taxes that are being lost in the mazes of computation and collection difficulties, should make the investment the most profitable in the world. That is the immediate and perhaps the most important consideration. There are other incentives.

"The prolongation of the volume of war taxation is sufficiently distressing without the indeterminate settlement of obligations incurred by business three or four years ago. We are mindful of the restriction upon industrial expansion, the worry and harassment of uncertainty and delay, the impending mass of complex litigation, and in general the whole gamut of economic waste and distress. Congress faces a heavy responsibility. Business is becoming impatient. The situation is becoming actually dangerous.

"The American Mining Congress suggests two remedies: First, the creation by Presidential appointment of a temporary board to be known as the Federal War Tax Settlement Board, vested with sufficient authority

not only to pass upon and settle cases consequent upon the war-time period, but with specific powers to compromise in simple equity the disputes that appear hopeless under interpretative application of the laws. Second, men and other means for the Income Tax Unit of the Bureau of Internal Revenue to function effectively."

Mr. Wilson declared that the Income Tax Unit is rapidly approaching chaos, and pointed out that the average wage paid to its 5,500 employes in Washington is \$1,650, and that they are supposed to be qualified to determine the correctness of million-dollar taxes. He mentioned the fact that no new men have been acquired since April 1, funds for promotion July 1 are not available, there have been many resignations, and he stressed the necessity of trained experts being employed to make decisions. He said if no relief is given the bureau immediately "the outlook for the future is appalling." Trained men could produce millions, it was stated, where low-salaried employees produce only hundreds of thousands, based on the belief that the undetermined taxes are to issue principally from the most complex cases. The poor working facilities of the income tax unit and the "fire-traps" with one exception in which it works, were scored, making an irreparable loss from fire possible.

#### Sales Tax Unnecessary

Speaking of the general sales tax, which has been the principal subject of discussion during the hearings, Mr. Wilson submitted that there is no necessity for such a levy. It was claimed that the general sales tax can scarcely be honestly urged by capital. The Secretary of the Treasury, Mr. Wilson said, has recommended the abolition of the excess profits tax upon corporations and reductions of the surtax upon incomes of the wealthy—not for sentimental reasons but for practical ones.

"The advocates of the general sales tax subscribe to that," the witness continued, "and then ask that Congress remove the existing excise taxes upon the luxuries of the rich men and transpose them to the dinner pail—a tax off the diamond shirt stud and onto the bone collar button. Capital is overburdened with taxation today, overburdened to the extent that it is reacting to the disadvantage of labor through restricted industrial expansion, but capital is coming to Congress with clean hands. It is asking relief on entirely tenable grounds; it must be rid of the excess profits tax incubus; it must have more incentive for profitable activity, but its common sense does not allow it to expect imposts upon the necessities of life.

"The real solution of the Federal tax problem is lower taxes, not juggling of taxes. If the war-time rates can be made to yield all they should—and Congress has the opportunity and the power—genuine relief is in prospect."

## EMPLOYEE REPRESENTATION

### It Is Favored at Meeting of Industrial Executives Held in Boston

Herbert F. Perkins, vice-president International Harvester Co., and Richard H. Rice, general manager Lynn Works, General Electric Co., were the principal speakers at a conference of industrial executives and managers held under the auspices of the Associated Industries of Massachusetts, in Boston, May 24. Other speakers included Howard Coonley, president Walworth Mfg. Co., Boston, and E. P. Fox, manager Federal Street Works, General Electric Co., Lynn.

All of the speakers favored employee representation in one form or another. Mr. Rice stated the existence of unions show the policy of employers must, at some time, have been wrong, but he warned manufacturers that if they installed the representation plan to break unions, they would be fooled. He is against the Leach plan, which other speakers advocated, because under it free intercourse of ideas is restrained. Human relation between all concerned is the important aim, he believes. The International Harvester Co. plan

of employment representation is well known and Mr. Perkins disclosed no new development in it.

#### In the Field of Labor

The Milwaukee district branch of the National Metal Trades Association reports that for the month of April of this year, 44 metal trades shops reported 12,902 employees as against 14,107 during March, a loss of 1205 for the month. The average number of hours worked in those shops during March was 41.3 hr., while for April it was 41.1. For the month of July, 1920, 36 shops employed 19,079, working 52½ hr. a week, while the same shops during April of this year employed only 12,425 at 41.1 hr. per week—a decrease of 35 per cent in employees and 21 per cent in hours.

The Ford Motor Co. has discontinued the payment of bonuses to the employees of the Fordson tractor plant in Hamilton, Ohio. To compensate for the bonuses, the wages of the employees have been increased by 2 to 3½c. per hour. It is understood that the increased wages will be retroactive to Jan. 1. About 300 men are now employed in the plant.



## American Iron and Steel Institute Meeting

(Continued from page 1469)

steels their superior merit. In this connection reference is made to the paper by J. D. Cutter,\* proposing the use of a merit index, developed by H. T. Chandler, for the comparison of different steels by employing a formula embracing the four static properties and indicating roughly the work done in breaking a test piece.

In direct relation to the foregoing, it should be noted that tests by the Izod machine on these steels showed chrome-molybdenum to possess a resistance to impact of 18 times that of the carbon steel and 34 per cent greater than the nearest alloy steel. As the impact test merely measures the work of rupture under a suddenly applied load, these results, which have been amply corroborated, clearly show the cumulative effect of the higher elastic ratio, elongation and reduction of area for a given tensile strength possessed by the molybdenum steels. Bending tests further bear this out.

In order to give an idea of how the chrome-molybdenum series of alloy steels compares with chrome-vanadium steels, a comparison of two types of each follows. The data on both of the chrome-vanadium steels is taken from a recent booklet published by the Vanadium Corporation of America presenting charts plotted by the metallurgical department of the United Alloy Steel Corporation. The data on both of the chrome-molybdenum steels were furnished the writer by the metallurgical department of the same company. Both series of tests were made on open-hearth steels.

Type 1—0.40 to 0.50 Per Cent Carbon					
Type	C	Mn	Cr	Va	Mo
Chrome-vanadium .....	0.47	0.85	1.19	0.15	....
Chrome-molybdenum ..	0.41	0.68	0.95	....	0.24

Sections,  $\frac{1}{4}$  in. round, quenched in oil from 1560 deg. Fahr. (Va.) and 1500 deg. Fahr. (Mo.). Drawn to show tensile strengths indicated.

	250,000 Lb. T. S.		225,000 Lb. T. S.		200,000 Lb. T. S.	
Type	E. L.	El. % R/A.	E. L.	El. % R/A.	E. L.	El. % R/A.
Cr-Va.	215,400	11.0 38.5	201,000	12.3 42.3	184,000	14.0 47.0
Cr-Mo.	222,000	9.0 43.5	201,000	10.3 47.9	179,000	13.3 52.2

Type 2—0.23 to 0.30 Per Cent Carbon					
Type	C	Mn	Cr	Va	Mo
Chrome-vanadium .....	0.27	0.71	0.98	0.15	....
Chrome-molybdenum ..	0.28	0.64	0.70	....	0.20

Sections,  $\frac{1}{4}$  in. round, quenched in water from 1625 deg. Fahr. (Va.) and 1525 deg. Fahr. (Mo.). Drawn to show tensile strengths indicated.

	175,000 Lb. T. S.		150,000 Lb. T. S.		125,000 Lb. T. S.	
Type	E. L.	El. % R/A.	E. L.	El. % R/A.	E. L.	El. % R/A.
Cr-Va.	157,300	15.0 60.5	137,500	17.7 62.8	112,400	21.2 66.9
Cr-Mo.	163,400	15.5 59.3	141,200	18.7 63.4	117,800	22.8 69.0

The molybdenum content of both of these types of the chrome-molybdenum steel is extremely low. For a comparison on a purely commercial basis, steels containing double the above content of molybdenum and showing higher physical properties might well have been used. Considering the lower manganese, chromium and molybdenum contents of the last-mentioned molybdenum steel, a comparison between its properties and those given in the table of Dr. Unger is interesting.

It has been stated above that the physical properties of molybdenum steel were progressively better as the molybdenum content is increased up to 1 per cent, and the table of properties below is presented to illustrate this point:

Sections,  $1\frac{1}{4}$  in. round and  $1\frac{1}{4}$  in. square, quenched in water from 1550 to 1600 deg. Fahr. Drawn to show a tensile strength of 175,000 lb. per sq. in.

Analysis Range		
C	Mn	Cr
0.28 to 0.36	0.44 to 0.64	0.70 to 1.04

\*Suggested Method for Determining Comparative Efficiency of Certain Combinations of Alloys in Steel. Trans. Amer. Soc. Steel Treathers (1920), 1183.

### Progressive Effect

	Mo 0.20	Mo 0.40	Mo 0.76
Elastic limit .....	167,000	164,000	162,000
Elongation per cent in 2 in. ....	13.5	16.6	19.5
Reduction of area, per cent. ....	52.0	58.4	61.0

For a constant tensile strength and very nearly constant elastic limit, the ductility of the steel is greatly increased by the addition of molybdenum from 0.20 up to 0.76. Conversely, of course, by employing suitable drawback temperatures, for a given ductility, the elastic limit and tensile strength will show an increase in like manner.

The more complex quaternary alloy steels containing molybdenum show extremely high characteristics, as will be seen by reference to the following tables. Both of these steels can be drawn back to better than 1000 deg. Fahr. before the tensile strength falls below 200,000, and to 900 deg. Fahr. before the elastic limit falls below this figure. The steel containing nickel exhibits remarkable physical properties at low drawing temperatures such as are employed in the production of oil-hardened gears, whereas the steel containing vanadium possesses greater possibilities at the higher drawing temperatures.

A low carbon steel to which about  $\frac{1}{4}$  per cent molybdenum is added possesses extreme ductility which makes it particularly adapted in sheet form to the manufacture of pressed steel parts and at the same time, when heat treated, is capable of showing fairly high physical properties.

Molybdenum steels also have the property of deep hardening, especially noticeable in the chrome-molybdenum series. Their properties are developed at higher drawing temperatures than employed with other steels, a fact directly related to their greater toughness and resistance to fatigue.

### The Adaptability of the Steel to Fabrication

It is in connection with this, the most important of all practical considerations, that the real commercial value of molybdenum is most evident. In the fabrication of an article from steel there are three fundamental operations:

Forging or cold pressing.  
Heat treating.  
Machining.

**Forging.**—Good forgeability is determined by three prime factors: The manner in which the steel flows; permissible range in forging temperatures; the extent to which the scale adheres to the steel.

The molybdenum steels flow readily under the dies and possess a wider safe forging range. It is in the ability to "throw the scale," however, that their chief advantage in forging lies. The scale on nickel and chrome-nickel steels adheres strongly to the bar, while that on the chrome-molybdenum comes off readily. A loose scale, such as that particularly characteristic of these steels is largely removed by the quenching operation during heat treatment, thereby eliminating pickling and hand cleaning of forgings before machining.

**Cold pressing.**—In sheet form, straight carbon molybdenum steel has proved to be, because of its great ductility, especially adaptable to parts which require extremely difficult forming operations. Also this steel can be treated to exhibit high strength and these qualities have made possible a much wider application of heat treatment to sheet metal parts than has heretofore been possible, as is indicated by the recent adoption of molybdenum steels by manufacturers of such commodities as automobile frames and implements such as shovels.

**Heat treating.**—A wide, safe heat treatment range is another characteristic of these steels. In hardening, a temperature variation of 200 deg. Fahr. is permissible, while in drawing, the properties fall off less rapidly and higher temperatures are used than with any other alloy steels. A great deal of data has been published to show that the static physical properties of molybdenum steel are practically constant over a wide range of temperature for quenching.

While carelessness in heat treatment might result from an undue stressing of this point, the fact that the

steels do possess this property is of material importance from the standpoint of the quantity producer. The high drawing temperatures mean greater ease in furnace regulation and the adaptability of the steel to heat treatment results in greater uniformity and fewer rejections.

**Machining.**—Corroborative evidence from a large number of plants, including several careful time study checks, shows that for a specified elastic limit or Brinell hardness these steels machine much more easily than other alloys. As typical of this experience, the metallurgist of one of the foremost automobile companies, in a recent report, says:

We have demonstrated that for a corresponding elastic limit or Brinell hardness, chrome-molybdenum steel machines much more easily than chrome-nickel and the nickel steels; . . . This quality can be made use of in one of two ways; either by producing parts of much greater strength and possessing a higher factor of safety, or by leaving the physical properties approximately the same as with other steels and effecting a great saving in machining cost and increasing largely the production in the machining departments.

#### The Total Cost of the Fabricated Article

These steels being commercially priced, the manufacturing advantages enumerated above make possible both increased production and decreased cost of the finished article.

In order to give this subject the breadth that it deserves, the author has quoted results from various steel mills, but would like to mention here that his own experience in the production of molybdenum steels has confirmed a majority of the data presented.

#### Conclusions

In 1905 this country produced a little over 20,000,000 tons of steel and less than 100,000 tons of alloy steel, a ratio in excess of 200 to one. In 1910 this ratio was reduced to less than 50 to one and in 1919 to less than 25 to one. Thus the production of alloy steel during this period has grown about eight times as fast as that of carbon steel.

For these reasons, the question of suitable alloys and particularly their availability for tonnage production becomes of greater importance to the American steel manufacturer than ever before.

Besides carbon, silicon and manganese which may be termed fundamental steel alloys, not more than 10 of all the known chemical elements have proven of value in steel making. From purely tonnage considerations, the commercial structural steels for moving and stationary parts, subjected to constant or suddenly applied loads, constitute the most important class of alloy steels. Only four of these 10 alloying elements have been found to impart to steels of this class sufficient commercially advantageous properties to warrant their adoption. These elements are nickel, chromium, vanadium and molybdenum employed in various combinations.

Of all the alloying elements, molybdenum alone is found in sufficient quantities within our borders to take care of the requirements of the American steel industry.

#### Discussion by Dr. John A. Mathews\*

The test data upon molybdenum steels, which has been gathered by the author from a wide number of sources and which represents work done by many of our leading metallurgists on both open-hearth and electric furnace molybdenum steels, seems to establish the case for molybdenum below one per cent. The data presented for the most part confirms very closely our own experience as the results of steel made at several of our plants and tested in several of our laboratories. We have made large quantities of the steel commercially during the past three or four years, and the results have been generally satisfactory from a manufacturing standpoint, and also from the standpoint of satisfaction to the users. In our investigations we have used all of the types mentioned in Mr. Hunter's paper, and we have compared them with the older types

of alloy steels, and our conclusions coincide with those given in Mr. Hunter's paper.

There is one point to which we wish to call very special attention, and, so far as I am aware, this point has never been brought out in any work on alloy steels with which I am familiar in this country, and that is the somewhat erratic values in yield point in very high tensile alloy steels at low drawback temperatures, say, below 800 deg. Fahr. It pains me to see the surprisingly idealistic curves which are sometimes presented, showing these properties with perfectly smooth curves for all drawback temperatures from 200 deg. Fahr. and upward, as from our experience covering a great many years, we have found yield point determinations as made by the ordinary methods somewhat variable and erratic at these lower drawback temperatures.

We also find that the shock test values at low drawing temperatures present a very unusual condition in certain types of alloys. We note what may be called a brittleness induced by drawing the temper. In a considerable series of chrome-molybdenum steels we find that the Izod value is lower when drawn at 600 than when drawn at 400 deg. Fahr. In some cases the value is lower at 800 than at 400 deg. Fahr. This is not meant as a specific criticism of chrome-molybdenum steels, for it is also seen in chrome-nickel steels, and possibly in some other types. I had never seen a discussion of this phenomenon until very recently. In the report of the Steel Research Committee of the Institution of Automobile Engineers of Great Britain this subject is dealt with.

The following table shows the results recently obtained at the Halcumb Steel Co., Syracuse, N. Y., on three different heats of chrome-molybdenum steel, and these heats were in every other respect perfectly normal and gave values for the ordinary physical properties quite in conformity with results from similar steels reported in Mr. Hunter's paper:

Izod Values of Chrome-Molybdenum Steels

	1	2	3
Carbon, per cent.....	0.31	0.34	0.44
Manganese, per cent.....	0.63	0.48	0.73
Chromium, per cent.....	1.01	0.46	0.92
Molybdenum, per cent.....	0.34	0.30	0.41
Izod Values			
Drawn at 400 deg. Fahr.....	27	24	15
Drawn at 600 deg. Fahr.....	9	18	9
Drawn at 800 deg. Fahr.....	15	46	15
Drawn at 1000 deg. Fahr.....	52	61	42
Drawn at 1200 deg. Fahr.....	78	82	77
Drawn at 1300 deg. Fahr.....	99	104	89

NOTE.—No. 1—Quenched in oil from 1575 deg. Fahr.

No. 2—Quenched in water from 1550 deg. Fahr.

No. 3—Quenched in oil from 1550 deg. Fahr.

The Izod figures given are the averages of three closely agreeing tests; all reheating temperatures were held for 30 min. at heat and then quenched in water.

I believe that any steel will meet with greater success when we know all of its properties and I have heard of some unsatisfactory results with chrome-molybdenum which I am inclined to think are explained by this phenomenon. The table serves to illustrate the extremely good Izod values obtainable after high drawback temperatures. This phenomenon is deserving of very careful investigation.

#### Discovery of Ore Reported

TORONTO, May 31.—It is reported that an important discovery of hematite iron has been made in the Cobalt, Ont., district. The territory lies within the triangle on the points of which are Cobalt, Porcupine and Sudbury, and the deposit lies in the Yarrow and Morel townships, within 14 miles of the railway at Elk Lake. The discovery was made by Frank Wescott of Elk Lake, who interested B. W. Hartley, a prospector of Cobalt, in the project. The ore is said to be exceedingly high grade. An analysis from the Morel deposit gave the following results: Iron, 55.98 per cent; silica, 19.60 per cent; phosphorus, 0.07 per cent.

The Manufacturers of Solder and Bearing Metals Association will hold a meeting in the Hotel Astor, New York, at 2 p. m. on June 2.

\*President Crucible Steel Co. of America, New York.



## FREIGHT ON IRON ORE

### Railroad Official Opposed to Reduction as Favored by Lake Superior Interests

WASHINGTON, May 31.—An attempt to justify existing rail rates on iron ore from upper lake mines to Lake Superior ports was made last week by Edward Chambers, vice-president of the Atchison, Topeka & Santa Fe Railroad, in charge of traffic, in connection with his testimony before the Senate Interstate Commerce Committee. Mr. Chambers went into detail to explain prices of Bessemer and non-Bessemer ore, rail rates to Lake Superior and lake rates from Superior to Erie ports for the period from 1893 to 1920 inclusive, and after telling the committee the basis upon which ore is sold, said that figures presented indicated that "after deducting the present rail rate to Lake Superior and the lake rate to Lake Erie, the producer received a much higher net price for his ore than in former years." Pointing out that shipments of ore are greatly affected by prevailing industrial conditions, especially with the steel production, Mr. Chambers gave figures showing the output of ore from the upper mines during the calendar years 1911 to 1920 inclusive, and compared these with the output of the entire United States for 1920. The latter included both iron and other ores. He placed the production of iron ore at 85,390,792 tons and said that of the total iron movement over 80 per cent is produced in the Lake Superior region. He drew the conclusion from the figures that the freight rates had no effect upon the movement of this product. However, he stated that at the present time there is a very light movement of ore "due to the very large quantity moved last year, a large proportion of which is still on the docks at the Lake Erie ports, mostly caused by the decline in the steel production and from small proportions of the furnaces being in operation at this time."

Despite the attitude of Mr. Chambers in trying to justify prevailing rates on iron ore carriers serving the mines in Wisconsin and Michigan at their own request, have held conferences with iron ore shippers and are said to have shown a willingness to withdraw tariffs they filed in February increasing the rates to Lake Superior ports, provided the shippers would withdraw their complaint against the previously existing rates from all of the upper ranges. The shippers have declined to do this, proposing instead to carry the case through to a final issue not only as it affects the last increases, but also the rates applying last year. Mr. Chambers' statement showing that freight rates had no effect upon the movement of ore in 1920 is held not to take into account the fact that ore is bought on yearly contracts and that with the steel industry greatly stimulated last year up to October, blast furnaces readily accepted shipments. It is pointed out that they could easily do this, despite the freight rates, on account of the high prices then prevailing on pig iron and steel.

#### Would Stabilize Purchases

Mr. Chambers' testimony related entirely to traffic matters. He said that if all doubt as to the likelihood of the reduction in freight rates would be removed, it would have a tendency to stabilize purchases at present levels. He contended that the uncertainty as to freight rates has caused hesitation among purchasers and others on the chance of some general action.

"It must be clear to all that no general reduction in freight rates or passenger fares can be made at this time, without serious results to the railroads," he added. "It is as much to the interest of the public as a whole that railroads have sufficient revenue, as it is to the individual railroad. Shippers' complaints of rate adjustments should first go to the carriers interested and the carrier and shipper should together endeavor satisfactorily to work them out. Any disagreements can be promptly handled by the Interstate Commerce Commission. I am satisfied that if this is done the situation will greatly improve. Wherever the rate is found to be prohibitory or unduly burdensome, it is

being modified. The carriers are just as anxious to do this as the shippers are to have it done."

#### Denies Inefficiency

H. E. Byram, president of the Chicago, Milwaukee & St. Paul Railroad Co., appeared before the committee and denied that the railroads of the country were not being operated efficiently. At great length he recited steps taken by railroad managers to prevent wastefulness and to install economic methods. In this connection he said that the practice of reclaiming waste material has been followed for years on the St. Paul railroad, as on others, with beneficial results. He told the committee that during the last two years \$2,268,000 has been realized by the reclamation of castings, forgings, springs, bearings, babbitts, hose couplings, brake beams, etc., most of this material being recovered from the scrap pile and at a small cost put in shape for use again. In addition to this economy during the same period, \$5,340,000 was realized from the sale of scrap material. Committees were organized some years ago, he said, to look after these particular matters and investigators are going over the road constantly supervising and encouraging these economies.

## MANY IDLE OVENS

### Almost Complete Suspension by Frick Company —Passing of the Beehive Type

UNIONTOWN, Pa., May 30.—Virtually all of the 19,000 ovens of the H. C. Frick Coke Co. in the Connellsville region have been put out of commission. On the other hand, the production of by-product coal, especially from the mines in the Klondike region, has been increased. The by-product ovens, it is understood, are now supplying virtually all the needs of the Steel Corporation.

Many of the ovens will never again be put into blast, even with resumption of normal operations. With the development of the by-product ovens, the old-fashioned bee-hive ovens have become an economic waste and the coal will be converted into coke as far as possible by the by-product method. The number of ovens in operation in the region is no longer any barometer of industrial conditions.

Coal production in the region continues to show improvement, although not of a spectacular nature. Furnace coke is quoted at as low as \$3.25. Coal is quoted at \$1.75 up.

#### Plant Operations

The Bettendorf Co., Bettendorf, Iowa, manufacturer of railroad cars and underframes, has shut down its plant indefinitely because of the scarcity of orders.

The Great Northern Railway closed every shop on its system except two, from May 27 to July 5. The Chicago & North Western Railroad has shut down its shops at Escanaba, Mich., for an indefinite period.

The Connecticut Electric Steel Co., 540 Flatbush Avenue, Hartford, Conn., is on a six day basis. Heretofore the plant operated on a four days a week schedule.

Foundries affiliated with the Belleville Manufacturers' Association, Belleville, Ill., were shut down recently because of the refusal of foundry laborers and shakerouts to accept 44c. an hour for a nine-hr. day. The scale paid to union men formerly was 55c. per hr. for an eight-hr. day.

For the first time since last Fall, the New Castle, Pa., plant of the American Sheet and Tin Plate Co. is operating full.

The Lebanon Brass Mfg. Co., Second and Canal streets, Lebanon, Pa., has recently completed an addition to its foundry which several times increases its capacity for the production of brass, bronze and aluminum castings. The new building has been equipped. The president of the company is Howard Desch and the vice-president and treasurer is Frank H. Wise.

# Machinery Markets and News of the Works

## RAILROADS INQUIRE

### Illinois Central, Great Northern and Santa Fe Are Factors in the Middle West

#### May No Better Than Previous Months, With One Exception—Small Manufacturers Chief Buyers

Railroad business has brightened slightly the machine-tool industry in the Middle West. The Illinois Central has asked for about 30 tools, all motor driven, in addition to those mentioned in these columns a week ago; some of these tools had been inquired for some time ago, but this time a purchase is expected to follow. The Great Northern is asking for about 10 machines, which will probably be bought at once. Cincinnati

manufacturers sold 20 machines to the Santa Fe.

From only one center, Cincinnati, is it reported that May was an improvement over other months; there it was the best of the year for many manufacturers. Several pending inquiries are old ones which have been revived because of lower prices and urgent need for equipment. Chief sales are to the small manufacturers and of single machines.

In the East, prospective business with China and Japan seems more promising than domestic business. The majority of New England dealers are optimistic; in that district there is an increase of inquiries, two or three aggregating several thousands of dollars; the New England Oil Refining Co. bought some plate-working equipment.

The decreased activity in the automobile industry has killed certain tentative business.

## New York

NEW YORK, May 31.

Inquiries from China and Japan seem to indicate that machine-tool buying from those sources is the most promising prospect in the market. Domestic business shows no signs of picking up. Very few orders are being placed.

The dullness in crane sales and new inquiries of recent weeks was repeated this week. Builders of hand power cranes and hoists note a fair business in parts and equipment. The city of New Bedford, Mass., is in the market for a small tractor crane through N. R. Conard, consulting engineer, 322 High Street, Burlington, N. J., and the Greenville Steel Car Co., Greenville, Pa., is inquiring for a 10-ton, 69-ft. 10-in. span overhead traveling crane, either new or used. The Bethlehem Shipbuilding Co., Sparrows Point, Md., is about to purchase a 5-ton, 12-ft. span hand power crane. James T. Kelly & Sons, 251 Greene Street, Brooklyn, N. Y., are receiving bids on a 10-ton, 50-ft. span hand power crane.

Among recent sales are: Shepard Electric Crane & Hoist Co., a 2-ton, 25-ft. span, single I-beam crane to the Chapman Valve Co., Indian Orchard, Mass.; New Jersey Foundry & Machine Co., a 2-ton hand power crane to the Vaughn Foundry Co., Norwich, Conn., and a 5-ton, 38-ft. span hand power crane to Lockwood, Greene & Co., Boston, for the Barber Asphalt Paving Co., Maurer, N. J.

The Durant Motors Corporation, 1764 Broadway, New York, has awarded contract to the Christian Construction Co., South Bend, Ind., for its proposed automobile manufacturing plant at Lansing, Mich., estimated to cost about \$3,000,000 with equipment. A large portion of the works will be given over to assembling, and a machine shop and metal-working building will be included in the group of structures to be erected. The plant will be known as the Edward Ver Linden Division of the corporation, and is expected to give employment to over 2500 men. It will be operated in conjunction with the assembling works at Long Island City, N. Y., comprising an eight-story building, recently acquired, and now being remodeled at a cost of about \$200,000. Construction of the Lansing plant will begin at once and it is planned to have the works ready for operation by the end of the year. W. C. Durant, president of the company, and D. A. Burke, president of the Sheridan Motor Car Co., Muncie, Ind., have acquired the Sheridan property from the General Motors Corporation, and this plant, it is said, will be operated as a division of the Durant Motors Corporation. The purchase, including plant and equipment, involves about \$5,000,000.

The Troy Tool & Casting Co., Colonie, N. Y., has been incorporated with a capital of \$50,000 by A. and F. J. Boerder, and P. B. Bird, Colonie, to manufacture tools, metal castings, etc. It is represented by Maclean & Neary, Cohoes, N. Y.

The Bedford Auto Rim Co., Brooklyn, has been incorporated with a capital of \$100,000 by I. S. Natkin, C. Z. and F. Weiner, and N. B. Finkelstein, 51 Chambers Street, New York, to manufacture metal automobile rims and kindred products.

The Utica Gas & Electric Co., 222 Genesee Street, Utica, N. Y., is completing plans for its proposed new generating

plant, 125 x 206 ft., to cost about \$1,500,000 with equipment. T. E. Murray, Inc., 55 Duane Street, New York, is architect and engineer.

The Mosher Machine Corporation, New York, has been incorporated with a capital of \$25,000 by R. F. Dugan, G. F. McCoy and G. H. D. Foster, 47 Cedar Street, to manufacture machine parts and automobile equipment.

The Seal-Tite Can Corporation, Brooklyn, has been incorporated with a capital of \$50,000 by J. E. Macry, C. Aroruri, and S. L. Mascoe, 16 Court Street, to manufacture metal cans and containers.

Ernest Distelhorst, Long Island City, N. Y., manufacturer of electric lamps and other electrical specialties, has acquired the Forest Smith mill, on Harrison Avenue, for the establishment of a new plant.

The Carbonized Fibre Products Co., New York, has been incorporated with a capital of \$110,000 by J. A. Boegman, W. R. Respass and L. F. Stumpf, 233 Broadway, to manufacture fibre specialties.

The Trojan Machinery Corporation, Flushing, L. I., has been incorporated with a capital of \$100,000 by John N. Rejan, Charles R. Barrett and Joseph W. Drake, 23 Flushing Place, Flushing, to manufacture laundry machinery and parts.

The Brooklyn Edison Co., 360 Pearl Street, Brooklyn, is having plans prepared for a new electric generating plant on Marshall Street, near the Brooklyn Navy Yard to cost about \$750,000. G. L. Knight, company address, is engineer.

The Fidelity Can Co., 600 South Caroline Street, Baltimore, has arranged for the establishment of a new plant at Brooklyn, for the manufacture of metal cans and containers. It recently completed additions to its Baltimore works.

The former plant of the Lozier Engine Co., Plattsburgh, N. Y., has been placed on the market. It comprises a one-story building, 75 x 250 ft., with heating and forge shop, with considerable equipment, including a traveling crane.

The Westinghouse Electric & Mfg. Co., 165 Broadway, New York, is arranging for the erection of new works on the Pacific Coast to handle business in that territory. Three main plants will be erected on sites to be selected at Los Angeles, San Francisco, and in the Puget Sound district, near Seattle, each estimated to cost approximately \$1,000,000 with machinery. Three other plants will also be constructed in other sections of the Coast. The company recently arranged for a bond issue of \$20,000,000.

The Patterson Auto Service Co., Rhinebeck, N. Y., is having plans prepared for a new one-story machine shop and service works, 50 x 130 ft. DuBois Carpenter, 45 Market Street, Poughkeepsie, N. Y., is architect.

Tindall & White, Inc., New York, has been incorporated with a capital of \$100,000 by C. A. White, 291 Broadway, and associates, to manufacture electrical appliances, lamps, etc.

The Board of Aldermen, Perth Amboy, N. J., is considering the erection of an addition to the municipal electric power plant to cost about \$50,000. Jay B. Franke, city electrician, will be in charge.

The Passaic Auto Sales Co., Garden Street, Passaic, N. J., is taking bids for the erection of a new two-story and basement service and repair building, 40 x 130 ft., at Howe and



Garden streets, to cost about \$75,000. Henry C. Sprague is head.

The American Radiator Co., East Forty-sixth Street, Bayonne, N. J., has secured rights to property, 399 x 475 ft., at the foot of Forty-ninth Street. It fronts on New York Bay, and will be reclaimed for plant service.

The Kil-Glar Co., Audubon, N. J., has been incorporated with a capital of \$250,000 by Samuel F. Dietrich and Charles Elser, Audubon; and John D. Bansk, Colwyn, N. J., to manufacture automobile truck shields, and other automotive equipment.

The Ferguson Forge Engineering Co., 763 Broad Street, Newark, has been incorporated with a capital of \$100,000 by Edward B. Pillow, Ira C. Boice and Arthur V. McPartland, 16 Ferry Street, to manufacture forgings and other metal products.

Aaron Friedman of the New Process Metals Co., 7 Mulberry Street, Newark, is planning the erection of a new factory to manufacture special metal products.

The Essex Metal Ceiling Co., 584 Bergen Street, Newark, has been incorporated with a capital of \$50,000 by Aaron and George Herr, and Max Kotzen, to manufacture metal products.

## Philadelphia

PHILADELPHIA, MAY 30.

The Smith & Furbush Machine Co., Hancock and Somerset streets, Philadelphia, manufacturer of textile machinery, has had plans prepared for extensions and improvements in its plant. C. E. Schermerhorn, 430 Walnut Street, is architect.

The Electric Sun Co. of Philadelphia has been incorporated with a capital of \$50,000 to manufacture electrically operated outdoor displays. A. V. R. Barringer, Jr., 1705 Mount Vernon Street, is treasurer.

The Pennsylvania Die-Cast Products Co., Philadelphia, has leased the four-story building at 1726 Sansom Street, for the establishment of a new plant.

The Imperial Garage Co., 3912 North Broad Street, Philadelphia, has commenced the erection of a new automobile service and repair building on Walnut Street, to cost about \$100,000.

The Coingum Mfg. Co., Philadelphia, has been incorporated with a capital of \$1,400,000 to manufacture vending machines and equipment. It is represented by Wray C. Arnold, Commonwealth Building.

The H. C. Bebbington Co., Inc., Trenton, N. J., has been incorporated with a capital of \$100,000 by Herbert W. Backes, C. T. and Harry C. Bebbington, 221 East Hanover Street, to manufacture iron and steel products.

Downer & Dias, Monongahela, Pa., operating the Keystone Garage, are considering the erection of a new two-story service and repair works, 60 x 180 ft., to cost about \$42,000.

The Bethlehem Steel Co., Bethlehem, Pa., has arranged for the immediate establishment of a department for the manufacture of steel wheels for motor trucks. The initial plant unit will be added to at a later date.

The Union Bronze Co., Reading, Pa., has been incorporated with capital of \$50,000 to manufacture brass and bronze products. Robert P. Fritch, Reading, is treasurer.

The Harrisburg Corporation, Seventh and Curtin streets, Harrisburg, recently organized to manufacture motor-driven tractors for farm service, has filed articles of incorporation under Delaware laws with a capital of \$1,500,000. T. F. Rainsford is one of the heads of the company, and will act as production engineer.

The Beagle Hame Mfg. Co., and the Hoch Hame Mfg. Co., Freeland, Pa., have been consolidated, and production in the future will be carried out at the plant of the first noted company. The works of the Hoch company were destroyed recently by fire.

The plant of the Scranton Electric Steel Co., Albright Street, Scranton, Pa., recently destroyed by fire, will be rebuilt, but manufacturing operations will not begin in less than six months.

## Chicago

CHICAGO, MAY 30.

The Illinois Central Railroad has added to the list of inquiries which was published in THE IRON AGE of May 26, page 1426. The additional tools asked for include:

One vertical hollow chisel mortising and boring machine with capacity to operate mortising chisels up to 2 in. square and to handle timbers 16 in. square.

One 30 in. heavy swing cut-off saw with standard 30 in. blade.

One plate-bending roll 7 ft. long by 6½ in. diameter upper roll.

One 42 in. high duty vertical lathe.

One 5 ft. plain heavy duty radial drill.

One automatic circular saw grinder suitable for sharpening both rip and cross-cut saws up to 42 in. in diameter.

One heavy duty double end axle lathe for machining all sizes of car axles.

One 42 in. coach wheel lathe.

One 18 in. opening x 75 in. throat depth pneumatic bull or yoke riveter for boiler work.

One 14 in. single spindle friction drill with capacity for ¾ in. hole.

Two 21 in. heavy pattern sliding head upright drills.

Eight self-contained electric-driven double floor grinders, each complete with two 1 in. x 3 in. Norton Alundum grinding wheels.

One 6 in. capacity high-speed power metal hack saw.

One heavy duty double end punch and shear with 48 in. throat, capacity for punching 1½ in. diameter hole through 1½ in. steel plate and shearing 1 in. plates or 6 in. x 1½ in. flat bar stock.

One 36 in. x 48 in. 50-ton or 75-ton power forcing press.

One 14 in. x 6 ft. bolt lathe.

One 18 in. x 14 ft. heavy duty engine lathe.

One 20 in. x 10 ft. engine lathe.

One 24 in. x 16 ft. heavy duty engine lathe.

One 3 in. x 36 in. turret lathe.

All of the equipment is to be motor-driven. Many of these machines were previously inquired for by the road without resulting in purchases. It is said, however, that buying can no longer be postponed and that this time orders are practically certain of being placed.

The Great Northern Railway Co., St. Paul, Minn., F. A. Bushnell, purchasing agent, is in the market for the following machines: One Newton belt-driven journal-box boring machine; one Cincinnati-Bickford or similar 42 in. belt-driven upright drill press; two Bridgeport or similar belt-driven floor dry grinders; one type V Combs or similar gyratory foundry riddle; one 48 in. double-end punch and shear for punching 1½ in. holes in 1 in. plate, arranged for motor drive; two Aurora or similar 24 in. belt driven sliding-head drills; one No. 61 Whiting or similar molding machine. The purchasing department states that these tools will be bought at once.

Current business continues to come mainly from small shops, which usually buy one machine at a time. The month of May was, on the whole, very dull and sales totals are not likely to exceed those of previous months this year.

Machine tool equipment has been bought for a federal vocational training school which has been established by the Government at Polk Street and Karlov Avenue, Chicago. Practically all of the tools bought were second hand, and while more machines are to be purchased, it is said that they are likely to come from surplus army or navy stocks.

The Superior Store Fixture Co., 1758 North Rockwell Street, Chicago, is having plans drawn for a one-story addition, 100 x 113 ft.

The Advance Forging & Tool Co., 527 Law Avenue, Chicago, has had plans drawn for a factory building.

The Crane Co., Chicago, contemplates erecting a boiler house addition.

The West Side Iron Works, Grand Rapids, Mich., has been incorporated with \$60,000 capital stock by Walter H. Gierston, Andrew Himmeland, 58 West Washington Street, Chicago, and others, to manufacture wood-working machinery.

Paul Schulte, 911 South Oak Park Avenue, Oak Park, Ill., has had plans prepared for an addition to his garage at 3416 North Ashland Avenue, Chicago, 74 x 60 ft., to be used as a repair shop.

The Cooper Corporation has leased the first floor of the building at 2001 Calumet Avenue, Chicago. The 10,000 sq. ft. of floor space will be used for automobile storage and repairs.

The Chicago Furnace Supply Co., whose quarters at Clinton and Monroe streets, Chicago, were burned on April 15, has purchased a four-story warehouse and factory at 1276-82 North Clybourne Avenue.

The Liberty Mfg. Co., St. Paul, Minn., has been organized with \$1,500,000 capital stock to manufacture a new automobile tire chain and mud lug. Several sites for a factory are now under consideration in the Midway district, near University Avenue. The officers are Charles Smith, Minneapolis, president; T. H. Livingston, Aberdeen, S. D., vice-president; G. M. Craig, Minneapolis, secretary and treasurer.

J. E. Comer, Erie, Kan., has purchased a building on North Main Street and will utilize it as a machine shop.

The Chicago Chaplet Co., has let contract for a one-story factory, 22 x 50 ft., at 1925 North Paulina Street, Chicago, to cost \$2,500.

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Local sales of machine tools for the month of May were no larger than those for April, and several houses report fewer orders. The New England Oil Refining Co., Fall River, Mass., has covered its requirements and has purchased a 24-in. lathe, 24-in. shaper, 4 ft. radial drill and plate equipment. A Pawtucket, R. I., concern about to manufacture an automobile part is inquiring for turret lathes, milling machines, engine and tool room lathes and other equipment. One local dealer has sold about \$3,000 worth of used machinery, including drill presses, automatic screw machines, etc., to a Cambridge firm. This sale is encouraging in view of the belief that the recent local auction sale had eliminated all used equipment prospects.

A fair demand for parts, replacements, gages and other small tools continues. One of the largest manufacturers of electric appliances is inquiring for several hundred dollars worth of 6 to 10-in. lathe chucks. Some chuck manufacturers report better domestic and export business. In the textile field sales of motors are increasing, but no improvement in demand from machine shops and other metal-working industries is noted.

The Horton Mfg. Co., Bristol, Conn., fishing tackle, has awarded contract for a three-story addition.

The Stoughton Nail Co., Stoughton, capitalized for \$50,000, has incorporated under Massachusetts laws. Edward A. Sheehan, West Stoughton, is president, and John B. Welch, 18 Prentice street, Cambridge, treasurer.

The Crane Co., Bridgeport, Conn., ball cocks, etc., has awarded contract for an addition and alterations to its power boiler house, to cost approximately \$125,000.

The American Steel & Wire Co., 94 Grove Street, Worcester, Mass., will commence work at once on the superstructure for its new three-story plant, 120x144 ft., at the South Works, estimated to cost about \$150,000. Foundation work has been completed.

The Sterling Parts Mfg. Co., Providence, R. I., has been incorporated with a capital of \$25,000 by John G. Aldrich, Frank W. Tillinghast and Ralph C. Watrous, 20 Dimon Place, to manufacture machinery and parts.

Joseph E. Greene, Inc., Boston, has been incorporated with a capital of \$350,000 to manufacture electrical equipment and supplies. Joseph E. Greene, 111 Federal Street, is president and treasurer; L. A. Greene and D. F. Cunningham are directors.

The Frank C. Fellows Co., Boston, manufacturer of brass, bronze and other metal products, has acquired the Andros-coggin foundry at Auburn, Me., for the manufacture of its products. A one-story addition will be erected. The company has acquired the plant and business of the Skowhegan Brass & Iron Foundry, Skowhegan, Me., which it will remove to the Auburn works.

The Standard Metal Products Co., Boston, has been incorporated with a capital of \$100,000 to manufacture metal goods. George R. Armstrong is president and Morris M. Fineberg, 34 Orange Street, Chelsea, Mass., treasurer.



The Meisel Press Mfg. Co., 944 Dorchester Avenue, Boston, Mass., is having plans prepared for a new one-story machine shop, 180 x 300 ft., to cost about \$200,000 with machinery. MacNaughton & Cleverden, 19 Congress Street, are architects.

The Ruggles Lightning Rod Co., Bangor, Me., has been organized by Charles H. Scribner and John Ruggles, Bangor, to manufacture lightning rods and kindred products.

The Brompton Pulp & Paper Co., Groveton, N. H., has arranged for a bond issue of \$2,500,000, the proceeds to be used for general operations and extensions. It is planning to rebuild the portion of its plant at East Angus, Que., destroyed by fire on May 5. F. N. McCrea is president.

The Rockwood Sprinkler Co., 38 Harlow Street, Worcester, Mass., manufacturer of sprinkling equipment, is planning for extensions and improvements in its plant to cost about \$15,000.

T. R. Knight, Framingham, Mass., machinist, will establish a new machine shop at 14 South Street.

## Pittsburgh

PITTSBURGH, MAY 30.

The machine-tool business shows no appreciable increase in this district and about the only hopeful feature is a revival of a few old inquiries against which revised quotations are being requested. One of these is a list put out some time ago by the Universal Steel Co., Bridgeville, Pa., which also is seeking a hammer and a straightener. The inquiry of the Greenville Steel Car Co., Greenville, Pa., for a 10-ton overhead crane, also has come to light again the past week. Current demands for machine tools still run entirely to individual pieces. One local dealer reports having sold a motor-driven 18-in. x 12-ft. lathe and a No. 1 plain Kemp-smith milling machine, both new tools, but generally, buyers are showing a marked tendency to buy used machines in good condition. The Boviard & Seyfang Mfg. Co., Bradford, Pa., which is constructing a new boiler and tank shop, will want two 5-ton cranes and two 7½-ton cranes, all of 40-ft. span, but will do no purchasing for at least two or three months. The Oliver & Snyder Steel Co., which soon will erect a boiler shop at No. 3 plant, Oliver, Pa., is a possible crane buyer. The improvements planned at the Steubenville plant of the LaBelle Iron Works, will probably mean inquiries before long for five or six cranes of varying capacities. Engineers have not yet completed their plans and the request for bids will not go out until they have done so.

El. A. Harrigan & Son, 520 Robinson Street, Northside, Pittsburgh, have plans under way for a two-story machine shop and automobile repair works, 56 x 68 ft.

The American Machine Screw Co., Pittsburgh, has filed notice of dissolution under State laws. Allen H. Kerr, 724 Frick Building, is representative.

A considerable portion of the bond issue of \$10,000,000, recently arranged by the Duquesne Light Co., Pittsburgh, will be used for extensions and improvements in electric plants and system in the city district, including work at the Colfax power plant, and the acquisition of the property of the Cheswick Power Co.

The Master Motors Corporation, Erie, Pa., now operating at Saginaw, Mich., is planning the erection of a new plant at Erie, and the removal of the business to this location. It was recently incorporated with a capital of \$2,500,000. D. H. Palmer, Erie, is president.

The Caloric Furnace Co., Erie, Pa., has been incorporated with a capital of \$30,000, to manufacture furnaces and furnace equipment. B. T. Garlick, Smethport, Pa., is treasurer.

The Motor Inn Co., Clarksburg, W. Va., has plans under way for a new one-story machine and repair shop. C. S. Warne is president.

Fire, May 19, destroyed the headhouse, conveyor system and other equipment at the plant of the War Eagle Coal Mining Co., Williamson, W. Va., with loss estimated at about \$50,000.

Fire, May 22, destroyed the headhouse, conveyor and other equipment at the plant of the Stone Mountain Coal Co., Matewan, W. Va., with loss of about \$30,000.

The Burnsville Handle & Dimension Co., Burnsville, W. Va., recently organized, is planning for the establishment of a factory to manufacture wheel rims, handles, spokes and similar equipment. M. W. Hefner is treasurer, and J. C. Ramage, manager.

Fire, May 19, destroyed the erecting shop at the plant of the American Car & Foundry Co., Huntington, W. Va., with loss estimated at about \$50,000, including equipment.

The Willis Branch Coal Co., Willis Branch, near Charleston, W. Va., is planning to rebuild the tipple at its plant, recently destroyed by fire.

## Detroit

DETROIT, MAY 30.

The Detroit Motor Bus Co., 1701 Dime Bank Building, Detroit, has awarded contract to the Austin Co., 1452 Penobscot Building, for a new one-story machine shop and automobile service building, 125 x 240 ft., at Connors Creek and Jefferson Avenue.

The S. & O. Sheet Metal Works, Detroit, has been organized to manufacture metal products. It is headed by Frank C. Fullerton and Otto Schwartz, 2549 La Salle Gardens, Detroit.

The Board of Public Lighting Commissioners, 138 East Atwater Street, Detroit, has preliminary plans under way for a new power plant. Smith, Hinchman & Grylla, 710 Washington Arcade Building, are architects.

R. H. Collins, president and general manager Cadillac Motor Car Co., Detroit, recently resigned, to take effect July 1, has acquired the former main plant of the company on Cass Avenue. Plans are under way for the manufacture of a new motor car, and a new organization, headed by Mr. Collins, will be formed. It is proposed to improve the works and install equipment for operation this summer.

The Kuhlman Electric Co., Twenty-sixth Street and Jefferson Avenue, Bay City, Mich., manufacturer of electrical specialties, has preliminary plans under way for a new one-story factory, to cost about \$35,000. John C. Hewitt is president.

The Eddy Paper Co., Three Rivers, Mich., has arranged for a bond issue of \$1,250,000, the proceeds to be used for general operations, extensions, etc.

The Detroit Precision Tap Co., Detroit, has filed notice of organization under Ohio laws, to manufacture taps, drills, etc., with capital of \$150,000. T. C. Emerson, East Cleveland, Ohio, heads the company.

The City Council, Marshall, Mich., has arranged a bond issue of \$85,000 for an addition to the municipal electric power house. Plans will be prepared at an early date. P. S. Joy, city commissioner, is in charge.

The Gunn Furniture Co., Grand Rapids, Mich., manufacturer of office equipment, etc., has awarded contract to the Owen, Ames, Kimball Co., 42 Pearl Street, for a four-story addition, 60 x 110 ft.

The Central Station Steam Co., 2910 Woodbridge Street, Detroit, will build a two-story addition to cost about \$30,000. J. V. Redfield is manager.

The Utility Compressor Co., Detroit, plans the erection of a one-story factory providing about 16,000 sq. ft. of floor space. Some equipment will be purchased.

## Baltimore

BALTIMORE, MAY 30.

The Seaboard Steel & Iron Corporation, Baltimore, recently incorporated with a capital of \$200,000 to manufacture iron and steel products, has taken title to land at the corner of Paca and West streets, as a site for the erection of its proposed plant. The company is headed by William F. Holl and Frederick W. Lauterbach, Gaither Building.

The Jump Spark Co., 311 American Building, Baltimore, has been incorporated with a capital of \$20,000 by Arthur C. Johnson, James E. Diffenderfer and A. Kliebant, to manufacture spark plugs and other ignition equipment.

The Bureau of Yards and Docks, Navy Department, Washington, is taking bids until June 8, for the erection of a new deferfization plant at the Naval Air Station, Pensacola, Fla., with pumping plant and other mechanical departments.

The Virginia Ores Corporation, 604 People's National Bank Building, Lynchburg, Va., is planning for the installation of new steam shovels and other equipment, in connection with the development of over 500 acres in this section. R. O. Brannan is secretary and treasurer.

The Southern Refrigerating Co., Bristol, Va., has been incorporated with a capital of \$400,000, to manufacture refrigerating machinery. S. R. Jennings, Bristol, is president; J. Polk Wolfe is secretary and treasurer.

The Teal Light & Power Co., Chesterfield, S. C., is planning for the erection of a new power house at Teal Pond, to replace the one recently destroyed by fire.

The Potomac Electric Power Co., 231 Fourteenth Street, N. W., Washington, will make extensions in its electric generating plant at Bennings, to cost about \$250,000.

The Southern Iron & Steel Corporation, Winston-Salem, N. C., recently organized, has preliminary plans under way for the erection of a new plant to manufacture furnaces and similar products. The capital has been increased from \$50,000 to \$125,000. Henry Johnson is president.

The Auto Relief Co., 1526 North Crawford Avenue, Chicago, has been incorporated with \$25,000 capital stock by J. Brenner, Phillip A. Wiertel, Harold Leybourne, Joseph Kramer, Nathan Weiss, Emanuel Tallackson, John E. Tobin, to conduct a garage, service station and repair shop.

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BOSTON, MAY 30.

The machine-tool business shows slight improvement, yet a majority of dealers are more optimistic than heretofore. Improved sentiment is based on an increase in the number of inquiries the past week or 10 days. The amount involved in individual instances usually is not large, but three or four are understood to aggregate several thousand dollars each, and at least two figure over \$10,000. Because of keen competition details are being withheld.

Local sales of machine tools for the month of May were no larger than those for April, and several houses report fewer orders. The New England Oil Refining Co., Fall River, Mass., has covered its requirements and has purchased a 24-in. lathe, 24-in. shaper, 4 ft. radial drill and plate equipment. A Pawtucket, R. I., concern about to manufacture an automobile part is inquiring for turret lathes, milling machines, engine and tool room lathes and other equipment. One local dealer has sold about \$3,000 worth of used machinery, including drill presses, automatic screw machines, etc., to a Cambridge firm. This sale is encouraging in view of the belief that the recent local auction sale had eliminated all used equipment prospects.

A fair demand for parts, replacements, gages and other small tools continues. One of the largest manufacturers of electric appliances is inquiring for several hundred dollars worth of 6 to 10-in. lathe chucks. Some chuck manufacturers report better domestic and export business. In the textile field sales of motors are increasing, but no improvement in demand from machine shops and other metal-working industries is noted.

The Horton Mfg. Co., Bristol, Conn., fishing tackle, has awarded contract for a three-story addition.

The Stoughton Nail Co., Stoughton, capitalized for \$50,000, has incorporated under Massachusetts laws. Edward A. Sheehan, West Stoughton, is president, and John B. Welch, 18 Prentice street, Cambridge, treasurer.

The Crane Co., Bridgeport, Conn., ball cocks, etc., has awarded contract for an addition and alterations to its power boiler house, to cost approximately \$125,000.

The American Steel & Wire Co., 94 Grove Street, Worcester, Mass., will commence work at once on the superstructure for its new three-story plant, 120x144 ft., at the South Works, estimated to cost about \$150,000. Foundation work has been completed.

The Sterling Parts Mfg. Co., Providence, R. I., has been incorporated with a capital of \$25,000 by John G. Aldrich, Frank W. Tillinghast and Ralph C. Watrous, 20 Dimon Place, to manufacture machinery and parts.

Joseph E. Greene, Inc., Boston, has been incorporated with a capital of \$350,000 to manufacture electrical equipment and supplies. Joseph E. Greene, 111 Federal Street, is president and treasurer; L. A. Greene and D. F. Cunningham are directors.

The Frank C. Fellows Co., Boston, manufacturer of brass, bronze and other metal products, has acquired the Andros-coggin foundry at Auburn, Me., for the manufacture of its products. A one-story addition will be erected. The company has acquired the plant and business of the Skowhegan Brass & Iron Foundry, Skowhegan, Me., which it will remove to the Auburn works.

The Standard Metal Products Co., Boston, has been incorporated with a capital of \$100,000 to manufacture metal goods. George R. Armstrong is president and Morris M. Fineberg, 34 Orange Street, Chelsea, Mass., treasurer.



The Meisel Press Mfg. Co., 944 Dorchester Avenue, Boston, Mass., is having plans prepared for a new one-story machine shop, 180 x 300 ft., to cost about \$200,000 with machinery. MacNaughton & Cleverden, 19 Congress Street, are architects.

The Ruggles Lightning Rod Co., Bangor, Me., has been organized by Charles H. Scribner and John Ruggles, Bangor, to manufacture lightning rods and kindred products.

The Brompton Pulp & Paper Co., Groveton, N. H., has arranged for a bond issue of \$2,500,000, the proceeds to be used for general operations and extensions. It is planning to rebuild the portion of its plant at East Angus, Que., destroyed by fire on May 5. F. N. McCrea is president.

The Rockwood Sprinkler Co., 38 Harlow Street, Worcester, Mass., manufacturer of sprinkling equipment, is planning for extensions and improvements in its plant to cost about \$15,000.

T. R. Knight, Framingham, Mass., machinist, will establish a new machine shop at 14 South Street.

## Pittsburgh

PITTSBURGH, MAY 30.

The machine-tool business shows no appreciable increase in this district and about the only hopeful feature is a revival of a few old inquiries against which revised quotations are being requested. One of these is a list put out some time ago by the Universal Steel Co., Bridgeville, Pa., which also is seeking a hammer and a straightener. The inquiry of the Greenville Steel Car Co., Greenville, Pa., for a 10-ton overhead crane, also has come to light again the past week. Current demands for machine tools still run entirely to individual pieces. One local dealer reports having sold a motor-driven 18-in. x 12-ft. lathe and a No. 1 plain Kemp-smith milling machine, both new tools, but generally, buyers are showing a marked tendency to buy used machines in good condition. The Bovard & Seyfang Mfg. Co., Bradford, Pa., which is constructing a new boiler and tank shop, will want two 5-ton cranes and two 7½-ton cranes, all of 40-ft. span, but will do no purchasing for at least two or three months. The Oliver & Snyder Steel Co., which soon will erect a boiler shop at No. 3 plant, Oliver, Pa., is a possible crane buyer. The improvements planned at the Steubenville plant of the LaBelle Iron Works, will probably mean inquiries before long for five or six cranes of varying capacities. Engineers have not yet completed their plans and the request for bids will not go out until they have done so.

El. A. Harrigan & Son, 520 Robinson Street, Northside, Pittsburgh, have plans under way for a two-story machine shop and automobile repair works, 56 x 68 ft.

The American Machine Screw Co., Pittsburgh, has filed notice of dissolution under State laws. Allen H. Kerr, 724 Frick Building, is representative.

A considerable portion of the bond issue of \$10,000,000, recently arranged by the Duquesne Light Co., Pittsburgh, will be used for extensions and improvements in electric plants and system in the city district, including work at the Colfax power plant, and the acquisition of the property of the Cheswick Power Co.

The Master Motors Corporation, Erie, Pa., now operating at Saginaw, Mich., is planning the erection of a new plant at Erie, and the removal of the business to this location. It was recently incorporated with a capital of \$2,500,000. D. H. Palmer, Erie, is president.

The Caloric Furnace Co., Erie, Pa., has been incorporated with a capital of \$30,000, to manufacture furnaces and furnace equipment. B. T. Garlick, Smethport, Pa., is treasurer.

The Motor Inn Co., Clarksburg, W. Va., has plans under way for a new one-story machine and repair shop. C. S. Warne is president.

Fire, May 19, destroyed the headhouse, conveyor system and other equipment at the plant of the War Eagle Coal Mining Co., Williamson, W. Va., with loss estimated at about \$50,000.

Fire, May 22, destroyed the headhouse, conveyor and other equipment at the plant of the Stone Mountain Coal Co., Matewan, W. Va., with loss of about \$30,000.

The Burnsville Handle & Dimension Co., Burnsville, W. Va., recently organized, is planning for the establishment of a factory to manufacture wheel rims, handles, spokes and similar equipment. M. W. Hefner is treasurer, and J. C. Ramage, manager.

Fire, May 19, destroyed the erecting shop at the plant of the American Car & Foundry Co., Huntington, W. Va., with loss estimated at about \$50,000, including equipment.

The Willis Branch Coal Co., Willis Branch, near Charleston, W. Va., is planning to rebuild the tippie at its plant, recently destroyed by fire.

## Detroit

DETROIT, MAY 30.

The Detroit Motor Bus Co., 1701 Dime Bank Building, Detroit, has awarded contract to the Austin Co., 1452 Penobscot Building, for a new one-story machine shop and automobile service building, 125 x 240 ft., at Connors Creek and Jefferson Avenue.

The S. & O. Sheet Metal Works, Detroit, has been organized to manufacture metal products. It is headed by Frank C. Fullerton and Otto Schwartz, 2549 La Salle Gardens, Detroit.

The Board of Public Lighting Commissioners, 138 East Atwater Street, Detroit, has preliminary plans under way for a new power plant. Smith, Hinchman & Grylls, 710 Washington Arcade Building, are architects.

R. H. Collins, president and general manager Cadillac Motor Car Co., Detroit, recently resigned, to take effect July 1, has acquired the former main plant of the company on Cass Avenue. Plans are under way for the manufacture of a new motor car, and a new organization, headed by Mr. Collins, will be formed. It is proposed to improve the works and install equipment for operation this summer.

The Kuhlman Electric Co., Twenty-sixth Street and Jefferson Avenue, Bay City, Mich., manufacturer of electrical specialties, has preliminary plans under way for a new one-story factory, to cost about \$35,000. John C. Hewitt is president.

The Eddy Paper Co., Three Rivers, Mich., has arranged for a bond issue of \$1,250,000, the proceeds to be used for general operations, extensions, etc.

The Detroit Precision Tap Co., Detroit, has filed notice of organization under Ohio laws, to manufacture taps, drills, etc., with capital of \$150,000. T. C. Emerson, East Cleveland, Ohio, heads the company.

The City Council, Marshall, Mich., has arranged a bond issue of \$85,000 for an addition to the municipal electric power house. Plans will be prepared at an early date. P. S. Joy, city commissioner, is in charge.

The Gunn Furniture Co., Grand Rapids, Mich., manufacturer of office equipment, etc., has awarded contract to the Owen, Ames, Kimball Co., 42 Pearl Street, for a four-story addition, 60 x 110 ft.

The Central Station Steam Co., 2910 Woodbridge Street, Detroit, will build a two-story addition to cost about \$30,000. J. V. Redfield is manager.

The Utility Compressor Co., Detroit, plans the erection of a one-story factory providing about 16,000 sq. ft. of floor space. Some equipment will be purchased.

## Baltimore

BALTIMORE, MAY 30.

The Seaboard Steel & Iron Corporation, Baltimore, recently incorporated with a capital of \$200,000 to manufacture iron and steel products, has taken title to land at the corner of Paca and West streets, as a site for the erection of its proposed plant. The company is headed by William F. Holl and Frederick W. Lauterbach, Gaither Building.

The Jump Spark Co., 311 American Building, Baltimore, has been incorporated with a capital of \$20,000 by Arthur C. Johnson, James E. Diffenderfer and A. Kilemant, to manufacture spark plugs and other ignition equipment.

The Bureau of Yards and Docks, Navy Department, Washington, is taking bids until June 8, for the erection of a new deferrization plant at the Naval Air Station, Pensacola, Fla., with pumping plant and other mechanical departments.

The Virginia Ores Corporation, 604 People's National Bank Building, Lynchburg, Va., is planning for the installation of new steam shovels and other equipment, in connection with the development of over 500 acres in this section. R. O. Brannan is secretary and treasurer.

The Southern Refrigerating Co., Bristol, Va., has been incorporated with a capital of \$400,000, to manufacture refrigerating machinery. S. R. Jennings, Bristol, is president; J. Polk Wolfe is secretary and treasurer.

The Teal Light & Power Co., Chesterfield, S. C., is planning for the erection of a new power house at Teal Pond, to replace the one recently destroyed by fire.

The Potomac Electric Power Co., 231 Fourteenth Street, N. W., Washington, will make extensions in its electric generating plant at Bennings, to cost about \$250,000.

The Southern Iron & Steel Corporation, Winston-Salem, N. C., recently organized, has preliminary plans under way for the erection of a new plant to manufacture furnaces and similar products. The capital has been increased from \$50,000 to \$125,000. Henry Johnson is president.

The Southern Ice Machine Mfg. Co., Charlotte, N. C., has plans under way for a new one-story plant, 50 x 140 ft. Frank Owens is president.

The J. M. Tull Rubber & Supply Co., 84 North Pryor Street, Atlanta, Ga., manufacturer of rubber specialties, has awarded contract to A. K. Adams & Co., Grant Building, for the erection of a new three-story and basement works. J. M. Tull is president and manager.

Fire, May 20, destroyed the plant of the Sandersville Cotton Oil Mill Co., Sandersville, Ga., with loss estimated at about \$100,000, including machinery. It will be rebuilt.

The Virginia-Carolina Chemical Co., Richmond, Va., is considering the erection of a new plant in the vicinity of Baltimore, for the manufacture of fertilizer products, estimated to cost in excess of \$2,000,000, including machinery.

The Atlantic Refining Co., 3144 Passyunk Avenue, Philadelphia, is reported to have acquired the Nauli Shipyard, on the Cape Fear River, near Wilmington, N. C., and has plans under way for the erection of an oil refinery.

The Metropolitan Garage Co., Washington, has plans under way for the erection of a new six-story service and repair works, estimated to cost about \$300,000. Milburn, Heister & Co., Union Savings Bank Building, are architects.

The Kemp Machinery Co., machine tools, machinery and machinists' supplies, 215 North Calvert Street, Baltimore, is in the market for a 1000 cu. ft. belt-driven air compressor, for pressure up to 40 lb. per sq. in.

Joseph Thomas & Sons, 836 Leadenhall Street, Baltimore, whose mill-working plant was recently destroyed by fire, will install considerable woodworking machinery. J. T. Lawton is president.

The Paragon Motor Car Co., Inc., 133 Baltimore Street, Cumberland Md., will establish a plant, 300 x 274 ft., for the manufacture of motor vehicles. It was recently organized with P. W. Blake president.

The Chamber of Commerce, Burlington, N. C., is interested in prices on equipment for the manufacture of furniture. J. V. Mann is secretary.

## Indiana

INDIANAPOLIS, MAY 30.

A new power plant will be constructed by the Best Grand Laundry Co., Senate Avenue and Court Street, Indianapolis, in connection with extensions and improvements in its works, estimated to cost about \$100,000. A new water-softening plant will also be installed.

The Harlan Mfg. Co., Columbus, Ind., has been incorporated with a capital of \$25,000 by H. D. Sanders, K. W. Danner and C. E. Sanders, Columbus, to manufacture acetylene generators and appliances.

The Indiana Oil Refining Co., Columbus, Ind., has taken bids for the erection of a new refinery estimated to cost about \$500,000, with machinery.

The Triangle Steel Products Co., Michigan City, Ind., has been incorporated with a capital of \$150,000 by H. C. Jostes, L. J. Finske and C. A. Kurrash, Michigan City, to manufacture tools, automobile parts and equipment.

The Board of County Commissioners, Court House, Fort Wayne, Ind., will build a new two-story power plant to cost about \$175,000.

## Cincinnati

CINCINNATI, MAY 30.

From the standpoint of orders booked, some machine-tool manufacturers report the month of May the best so far this year, although there were no large lists. A local manufacturer last week received an order from the Santa Fe Railroad for about 20 machines, covering part of the reservation made some time ago by this road. The Indianapolis & Louisville Railroad Co. was also a purchaser, taking a Niles No. 1 car wheel lathe. The Hocking Valley and Big Four railroads are said to be about to close for part of the equipment recently inquired for. The Illinois Central Railroad has a list out for approximately a dozen tools, and it is stated that other lists from this road will follow. Dealers report the local market as spotty. There is still a fair demand for used tools from the smaller shops, but the call for new machinery is light. Some of the larger manufacturers in this district are disposing of part of their old equipment, which they will replace with more modern tools.

The Indianapolis & Louisville Railroad Co., Louisville, Ky., purchased a 15-ton Niles traveling crane the past week, and the city of Indianapolis closed bids May 25 for a crane of similar capacity, the award probably to be made this week. It is reported that the Norton Iron Works, Ashland, Ky., will purchase two overhead traveling cranes soon, bids for which have been taken.

The Brunhoff Mfg. Co., Cincinnati, manufacturer of metal specialties, has purchased property at the corner of York and Freeman streets and has taken out a building permit for

the erection of a plant to cost about \$60,000. E. Brunhoff is president.

The Shepard Elevator Co., Cincinnati, recently incorporated, has leased manufacturing space in a building at Canal and Jackson streets, and will build electrically driven freight and passenger elevators. O. F. Shepard is president.

The Universal Equalizer Co., Cincinnati, will incorporate with a capitalization of \$10,000 to take over the company of the same name engaged in the manufacture of gripping devices, at 132 Opera Place. D. T. Williams is president and general manager.

## Cleveland

CLEVELAND, May 30.

Most of the machine-tool business being placed is coming from the smaller manufacturing plants not associated with the automobile industry and sales are usually limited to single machines. A few inquiries, involving a number of tools, are pending, but in several cases the placing of orders is being deferred until business conditions improve. Some business that was in prospect from automobile parts manufacturers will not be placed because of the recent slump in the automobile industry. A local house has taken an order from the Diebold Safe & Lock Co. for a milling machine and lathe. The Kelly Island Lime & Transport Co., which will build a stone crushing plant at Marblehead, Ohio, is inquiring for a 10-ton electric traveling crane.

The Lima Sheet Metal Products Co., Lima, Ohio, has placed contract with the Lima Construction Co. for a new plant. The main building will be 60 x 234 ft. and will have three 40 x 60 ft. wings. When completed, it will give the company three times its present capacity.

The Woods Engineering Co., Alliance, Ohio, which is erecting an addition, 63 x 131 ft., has increased its capital stock from \$30,000 to \$350,000. It will shortly add jacks to its present line of products.

The Armature Coil Equipment Co., 3202 Scranton Road, Cleveland, has placed contract for a one-story factory, 30 x 40 ft.

The Turbine Air Tool Co., Cleveland, has made an arrangement with the Martell Packings Co., Elyria, Ohio, under which the Elyria company will manufacture the line of tools marketed by the Turbine company, which includes wood and metal drills, grinders, wood planers, groovers, etc.

The Master Tool Co., 203 East St. Clair Avenue, Cleveland, has been organized under the laws of Ohio to manufacture a new line of pneumatic tools and specialize in the reclaiming of all makes. The officers are: J. Nightingale, president; Charles F. Overly, vice-president, and general manager; William Eckert, secretary-treasurer. C. F. Overly is manager of sales.

## The Central South

ST. LOUIS, May 30.

The E. A. Martin Machinery Co., Joplin, Mo., has plans under way for a new two-story machine shop and metal works at School and Fifth streets. Guileman and Martinie, 420 North Wall Street, are architects.

The Tulsa Stone & Foundry Co., Tulsa, Okla., has been incorporated with a capital of \$150,000 by George Kinnery, Tulsa, and A. C. Spitnagel and E. M. Yates, Sand Springs, Okla., to manufacture iron castings and other metal products.

The City Council, Osborne, Kan., is arranging for the erection of its new municipal electric power plant, estimated to cost about \$75,000. E. T. Archer & Co., 612 New England Building, Kansas City, Mo., are engineers. S. P. Crampton is city clerk.

The Eagle Motor Truck Co., 6154 Bartmer Avenue, St. Louis, has acquired a local site for the erection of its new one-story plant, 50 x 100 ft., estimated to cost about \$50,000 with machinery. Plans for the structure are being prepared.

The Stephens Branch Coal Co., Prestonburg, Ky., is planning to purchase equipment for installation at its properties, to comprise complete power plant machinery, with boilers, steam turbine, etc., industrial railroad, cars and other apparatus. S. C. Ferguson is manager.

The Common Council, Sayre, Okla., has plans under way for a new municipal electric light and power plant. V. V. Long & Co., 1300 Colcord Building, Oklahoma City, Okla., are engineers.

The Chicago, Rock Island & Pacific Railroad, La Salle Street Station, Chicago, is planning to rebuild its locomotive and car shops at Trenton, Mo., recently destroyed by fire with loss estimated at about \$50,000.

The City Council, Martin, Tenn., has disposed of a bond issue of \$100,000, the proceeds to be used for the erection of a new municipal power plant, 70 x 100 ft. Bids will be received about June 9. F. L. Wilcox, Chemical Building, St. Louis, is engineer.



The Common Council, Fulton, Mo., is planning for a new boiler, engine, generating and other machinery installation for a municipal electric power plant, estimated to cost in excess of \$30,000.

The Transcontinental Oil Co., Tulsa, Okla., is planning the erection of a new oil refining plant in the vicinity of El Dorado, Ark.

The Constantin Refining Co., Tulsa, Okla., is completing plans for the construction of a new refinery in the vicinity of El Dorado, Ark., estimated to cost in excess of \$75,000.

The Oneta Refining Co., Oneta, Ark., recently organized with a capital of \$250,000, is planning for the erection of a new oil refining plant on a local site. Henry Miers, Oneta, is head of the company.

The Arkansas Refineries Co., Little Rock, Ark., is planning for the construction of a new oil refinery in the vicinity of Picon, Ark., with initial daily capacity of about 500 bbl. Joseph Berger is president, and J. M. Sims, secretary, treasurer and general manager.

The Common Council, Duncan, Okla., has approved a bond issue of \$300,000 for the construction of an addition to the municipal electric power plant and the installation of new equipment. J. F. Elwell is manager.

The Traders Compress Co., Fort Worth, Tex., has plans under way for the erection of a new cotton compress plant at Oklahoma City, Okla., to cost about \$500,000, with machinery. It will have a capacity of about 25,000 bales.

## The Gulf States

BIRMINGHAM, MAY 30.

H. O. Boatwright and P. E. Mangum, Bryan, Tex., have organized a company to establish a local plant for the manufacture of spraying machinery and similar equipment. It will operate with a capital of \$100,000.

The Edmonds Oil & Refining Co., Fort Worth, Tex., has plans under way for an addition to its refinery at Riverside, to increase the daily capacity from about 2000 to 3000 bbls.

The Wonder Trap Co., Waco, Tex., has plans under way for the construction of a new plant for the erection of traps. It recently increased its capital to \$100,000. A site, 100 x 165 ft., has been acquired.

The Roxana Petroleum Co., Crystal Falls, Tex., has plans under way for the erection of a new refinery. C. N. Formes is in charge.

George R. Hill, Tyler, Tex., and associates, are planning for the establishment of a new brick manufacturing plant, with initial capacity of about 10,000 bricks per day.

The Home Guano Co., Dothan, Ala., is planning to rebuild its fertilizer manufacturing plant, recently destroyed by fire. A list of equipment is being prepared, to include general manufacturing machinery, transmission equipment, belting, etc. M. L. Hanahan is treasurer and general manager.

The Merrill-Stevens Drydock & Repair Co., Jacksonville, Fla., is considering the establishment of a new shipyard and marine railroad at Miami, Fla., for repair work.

The Wallace Refining Co., of Taft, Cal., plans to build an oil refinery at Fort Stockton, Tex.

The municipal electric light and power plant at Georgetown, Tex., will be enlarged to double its present capacity.

## California

LOS ANGELES, MAY 24.

The Ever Ready Heater Co., 211 South Spring Street, Los Angeles, manufacturer of heating equipment, has acquired about 4½ acres at San Fernando Road and Broadway, Glendale, for the erection of a new plant. The initial unit will be one-story, brick and steel, 100 x 250 ft., and will be followed later by other buildings.

The Los Angeles Tire & Tube Co., 1338 East Slauson Avenue, Los Angeles, has filed notice of organization to manufacture tires and tubes. T. J. Barker, 1140 East Sixtieth Street, heads the company.

W. C. Durant, president of Durant Motors, Inc., 1764 Broadway, New York, and other officials of that corporation, have formed the Durant Motor Co. of California, for the establishment of a Pacific Coast plant at Oakland, on site now being selected. Plans of the structure are under way.

S. M. Stranahan and J. F. Mora, Pittsburg, Cal., are organizing a company to build a plant at Martinez, Cal., for the manufacture of automobile tires of solid rubber type. Negotiations are under way with the Board of City Trustees, Martinez, for a site on the waterfront.

The Delhi Power Co., Nevada City, Cal., recently organized, is planning the construction of a new hydroelectric power plant on the Middle Fork of the Yuba River. Fred Searls heads the company.

The California Door Co., Diamond Springs, Cal., has completed plans for rebuilding its plant, recently destroyed by fire. Considerable new machinery will be installed. It is proposed to begin operations in about 60 days.

L. D. Stoff, 746 Hyde Street, San Francisco, has filed plans for a new one-story, brick machine shop on North Turk Street.

## Canada

TORONTO, MAY 30.

The demand for machine tools in this section continues to improve. Inquiries for equipment are coming through in considerable numbers and many are resulting in business, although sales are chiefly confined to one or two tools at a time. Wood-working machinery and equipment for mining plants are fairly brisk. Small tools are also selling more freely than for some time. There is considerable competition for the business offered and some dealers are shading prices to book orders.

The town of Antigonish, N. S., is contemplating the construction of a pumping station to cost \$15,000 and will require some new equipment.

Warren Brothers, 314 Talbot Street, East London, Ont., are preparing to erect a machine shop at a cost of \$25,000 and will shortly be in the market for equipment.

The town of Leduc, Alta., will erect an electric light plant to cost \$20,000. A. G. Campbell is secretary.

The Canadian Edison Appliance Co., Ltd., Stratford, Ont., will have about \$30,000 worth of die work to give out during the year and desires to get in touch with firms who can handle this kind of work. The company manufactures the Edison, Hotpoint and Hughes lines of electric goods.

The Canadian Locomotive Co., Kingston, Ont., has no orders on its books and has closed its works. It will, however, immediately begin the erection of an addition to its plant, at a cost of approximately \$110,000, to provide greater facilities for handling material and future business.

The Happy Home Mfg. Co., Ltd., Toronto, has been incorporated with a capital stock of \$40,000 by Daniel A. Lee, 32 Barrington Avenue; George S. Winder, 167 Kingswood Road; Frank F. Frendt and others to manufacture hand, gas, electric and water power machines, wringers, etc.

The West Window Regulator Co., Ltd., Toronto, has been incorporated with a capital stock of \$100,000 by James H. G. Wallace, 33 Richmond Street West, Toronto; John F. West, Carl Ess, Buffalo, N. Y., and others to manufacture automatic window regulators, metal goods, etc.

The Kemp Metal Auto Wheel Co., Ltd., Toronto, has been incorporated with a capital stock of \$1,000,000 by James W. Bicknell, 6 Adelaide Street East; Edward Kemp, 358 Queen Street West; George W. Marley and others to manufacture automobile and metal wheels, machinery, metal goods, etc.

The National Household Appliances, Ltd., Sackville, N. B., has been incorporated with a capital stock of \$400,000 by Jude Gueguen, Sackville; Robert Carter, Halifax, N. S., and others to manufacture washing machines, dishwashers, appliances, etc.

## Trade and Office Changes

The New York office of A. G. Kidston & Co., Glasgow, Scotland, in charge of H. W. C. Gausden, has removed from 11 Broadway to 2 Rector Street. The company handles exports of iron, steel, non-ferrous metals, machine tools and machinery and coal to all markets.

The capitalization of the Parker Supply Co., manufacturer, 785 East 135th Street, New York, has been increased to enable a wider range of activity and permit of greater production. The J. G. White Management Corporation has assumed the management of the company. The entire personnel has undergone a change, and the following officers were elected at a recent meeting of the board of directors: Walter Rautenstrauch, president, professor of mechanical engineering at Columbia University, and vice-president of the J. G. White Management Corporation; William S. Bowen, mechanical engineer, vice-president and treasurer; D. L. Boyd, mechanical engineer, secretary and general manager, formerly industrial engineer with the J. G. White Management Corporation, production manager Mennen Co., production manager the Mergenthaler Linotype Co. The officers, in co-operation with the J. G. White Management Corporation, will guide the policies of the reorganized company. H. Rosenberg, inventor and patentee of the many patents covering Parker products, and who was president of the company since its inception, has sold the controlling interests to the new syndicate, and has leased the patents to the company. Mr. Rosenberg will now act in an advisory capacity for the designing of further patents and improvements of new items. The company expects to bring forth several valuable improvements in specialties for the hardware and sheet metal trades.

# Current Metal Prices

On Small Lots, Delivered from Merchants' Stocks, New York City

The quotations given below are for small lots, as sold from stores in New York City by merchants carrying stocks.

As there are many consumers whose requirements are not sufficiently heavy to warrant their placing orders with manufacturers for shipment in carload lots from mills, these prices are given for their convenience.

On a number of articles the base price only is given, it being impossible to name every size.

The wholesale prices at which large lots are sold by manufacturers for direct shipment from mills are given in the market reports appearing in a preceding part of THE IRON AGE under the general heading of "Iron and Steel Markets" and "Metal Markets."

## Iron and Soft Steel Bars and Shapes

Bars:	Per Lb.
Refined bars, base price.....	3.23c.
Swedish bars, base price .....	12.00c.
Soft steel bars, base price.....	3.23c.
Hoops, base price .....	4.15c. to 4.28c.
Bands, base price .....	3.88c.
Beams and channels, angles and tees	
3 in. x ¼ in. and larger, base.....	3.23c. to 3.33c.
Channels, angles and tees under 3 in. x	
¼ in., base .....	3.23c.

## Merchant Steel

	Per Lb.
Tire, 1½ x ½ in. and larger.....	3.23c.
(Smooth finish, 1 to 2½ x ¼ in. and larger) ..	3.43c.
Toe calk, ½ x ¾ in. and larger.....	3.75c.
Cold-rolled strip, soft and quarter hard.....	10.00c. to 10.50c.
Open-hearth spring steel.....	4.50c. to 8.00c.
Shafting and Screw Stock:	
Rounds .....	4.73c.
Squares, flats and hex.....	5.23c.
Standard cast steel, base price.....	14.00c.
Extra cast steel .....	17.00c.
Special cast steel .....	22.00c.

## Tank Plates—Steel

¼ in. and heavier.....	3.23c. to 3.33c.
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## Sheets

### Blue Annealed

	Per Lb.
No. 10 .....	4.23c. to 4.25c.
No. 12 .....	4.28c. to 4.30c.
No. 14 .....	4.33c. to 4.35c.
No. 16 .....	4.44c. to 4.45c.

### Box Annealed—Black

	Soft Steel C.R., One Pass Per Lb.	Blued Stove Pipe Sheet Per Lb.
Nos. 18 to 20.....	4.95c. to 5.18c.	.....
Nos. 22 and 24 .....	5.00c. to 5.23c.	5.60c.
No. 26 .....	5.05c. to 5.28c.	5.65c.
No. 28 .....	5.15c. to 5.38c.	5.75c.
No. 30 .....	5.40c. to 5.63c.	.....

No. 28, 36 in. wide, 10c. higher.

## Galvanized

	Per Lb.
No. 14 .....	4.75c. to 5.38c.
No. 16 .....	5.00c. to 5.63c.
Nos. 18 and 20.....	5.15c. to 5.78c.
Nos. 22 and 24.....	5.30c. to 5.93c.
No. 26 .....	5.45c. to 6.08c.
No. 27 .....	5.60c. to 6.23c.
No. 28 .....	5.75c. to 6.38c.
No. 30 .....	6.25c. to 6.88c.

No. 28, 36 in. wide, 20c. higher.

## Welded Pipe

### Standard Steel

	Blk.	Galv.		Blk.	Galv.
½ in. Butt....	—46	—30	¾ in. Butt....	—18	List
¾ in. Butt....	—52	—37	1-1½ in. Butt.....	—20	— 2
1-3 in. Butt..	—54	—40	2 in. Lap .....	—14	+ 3
3½-6 in. Lap.	—49	—35	2½-6 in. Lap..	—18	— 2
7-12 in. Lap..	—40	—24	7-12 in. Lap..	— 7	+10

### Wrought Iron

## Steel Wire

BASED PRICE\* ON NO. 9 GAGE AND COARSER

	Per Lb.
Bright basic .....	4.50c.
Annealed soft .....	4.50c.
Galvanized annealed .....	5.25c.
Coppered basic .....	5.00c.
Tinned soft Bessemer.....	6.50c.

\*Regular extras for lighter gages.

## Brass Sheet, Rod, Tube and Wire

BASE PRICE

High brass sheet.....	17 c. to 19¼c.
High brass wire .....	18¼c. to 21¼c.
Brass rod .....	16 c. to 20¼c.
Brass tube, brazed .....	30½c. to 31½c.
Brass tube, seamless .....	20½c. to 21½c.
Copper tube, seamless .....	22½c. to 23½c.

## Copper Sheets

Sheet copper, hot rolled, 24 oz., 22c. to 24c. per lb. base.
Cold rolled, 14 oz. and heavier, 2c. per lb. advance over hot rolled.

## Tin Plates

Bright Tin	Grade	Grade	Coke—14x20	Primes	Wasters
	"AAA"	"A"			
	Charcoal	Charcoal	80 lb....	\$7.30	7.05
	14x20	14x20	90 lb....	7.40	7.15
	IC..\$11.10	\$10.00	100 lb....	7.50	7.25
	IX.. 12.30	11.25	IC...	7.70	7.45
	IXX.. 14.10	12.75	IX...	8.60	8.35
	IXXX.. 16.10	14.75	IXX...	9.60	9.35
	IXXXX.. 17.70	16.50	IXXXX...	11.00	10.75
				12.00	11.75

## Terne Plates

8-lb. Coating 14 x 20

100 lb. ....	\$8.00
IC .....	8.25
IX .....	8.50
Fire door stock .....	11.50

## Tin

Straits pig .....	35c.
Bar .....	40c. to 42c.

## Copper

Lake ingot .....	16c.
Electrolytic .....	16c.
Casting .....	16c.

## Spelter and Sheet Zinc

Western spelter .....	4.6½c. to 6¼c.
Sheet zinc, No. 9 base, casks.....	12c. open 13c.

## Lead and Solder\*

American pig lead .....	6c.
Bar lead .....	6½c. to 7c.
Solder, ½ and ½ guaranteed.....	24¼c.
No. 1 solder .....	21½c.
Refined solder .....	18½c.

\*Prices of solder indicated by private brand vary according to composition.

## Babbitt Metal

Best grade, per lb.....	80c.
Commercial grade, per lb.....	40c.
Grade D, per lb.....	35c.

## Antimony

Asiatic '.....	6½c. to 7c.
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## Aluminum

No. 1 aluminum (guaranteed over 99 per cent pure), in ingots for remelting, per lb....	30c. to 33c.
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## Old Metals

Business is quiet though the market is firm. Dealers' buying prices are nominally as follows:

	Cents Per Lb.
Copper, heavy and crucible.....	10.50
Copper, heavy and wire.....	9.75
Copper, light and bottoms.....	8.00
Brass, heavy.....	5.75
Brass, light .....	4.00
Heavy machine composition.....	9.75
No. 1 yellow brass turnings .....	5.00
No. 1 red brass or composition turnings .....	7.50
Lead, heavy .....	4.00
Lead, tea .....	3.00
Zinc .....	3.00



